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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

In the Matter of the Membership List, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF SECRETARY,
EAST BOSTON, MASS., November 25, 1906.

To the Members of the New England Association of Gas Engineers: Any member of the Association whose present address is other than that in the printed list of March, 1906, will confer a favor upon the Secretary by notifying him of said change.

N. W. GIFFORD, Secy.,
No. 26 Central Square, Boston, Mass.

BRIEFLY TOLD.

THE ILLUMINATING ENGINEERING SOCIETY, NEW YORK SECTION.—The Secretary of the New York Section, Illuminating Engineering Society, informs us that the December meeting of the New York Section of the Society was held in the Edison Auditorium, New York, the evening of last Friday. Writing under present advices, which are decidedly meager, we understand the meeting was quite a successful one, the paper contributor for the session being Mr. C. P. Steinmetz. Secretary Millar has made mention of the fact that members desiring to receive advance copies of papers should apply to him in writing, whereupon he will forward copies to such applicants whenever it is found possible to print the papers sufficiently in advance of the date of a meeting. This is decidedly a long step in the right direction.

THE ILLINOIS GAS ASSOCIATION.—We are indebted to the courtesy of Mr. J. M. Robb, Secretary of the Illinois Gas Association, for the information that the Executive Committee at a meeting held the 30th ult., it was decided among other matters, that the next annual session would be brought off in Peoria, March 20–21, 1907. Several other questions of great interest to Illinois gas men were discussed at the meeting and action was taken to get the subject or gist of same in shape to be presented to the Peoria meeting of the Association. Several papers on important and interesting subjects have already been promised for the meeting, and altogether, Secretary Robb in conclusion remarks: "The prospects are so good for a very profitable and interesting session that no Illinois gas man can afford to miss attending." That's the way to talk, Mr. Secretary. This reference to the Illinois Association would be incomplete did we fail to mention a neat piece of work recently gotten out at the instance of the Association's Bureau of Information. The work consists of a sheet, entitled "Directory of Illinois Gas Companies," which sheet carries the name of each gas company in the State (there are 56 of them), the names of the officers—from President to Superintendent—population of place supplied, sendout in cubic feet per annum, miles of mains, number of meters set, and selling rates charged. The sheet also carries other information respecting districts supplied, etc. Of the 56 Companies listed 39 are members of the Association.

THE LACLEDE COMPANY'S SUIT AGAINST THE GAS CONSUMERS' ASSOCIATION OF ST. LOUIS.—The trial of a very interesting suit, that of the Laclede Gas Light Company, of St. Louis, Mo, to restrain the Gas Consumers' Association, of the same city, from attaching what is called a gas restraining, consuming device on the pipes or meter fixtures of the plaintiff, was recently tried before Judge Fisher. The suit was originally commenced last July, at which time the Laclede Company sued out an injunction restraining defendant from in any manner affixing to the meter connections of plaintiff any device whatsoever, and asking for an order that such devices heretofore affixed be forthwith removed. The case went over during the vacation period, and now comes up for trial on the merits of the pleading. The correspondent who informed us as to the progress of the case, incloses the following respecting the testimony taken: "The first witness was Mr. E. G. Cowdery, Vice-President and General Manager of the Laclede Company, who testified that he assumed charge of the Company in 1903, coming to St Louis

LIBRARY OF CONGRESS DEC 17 1906 SMITHSONIAN DEPOSIT

from Milwaukee, and then went on to say: A few years ago meter connections were made with the service pipes by means of lead pipes, which often became dented, causing a disturbance to the gas flow. The Laclede Company had, however, replaced all of the lead pipes (about 170,000 in number) with iron pipes, at a cost of $300,000. The substitution was made because the iron pipes were rigid, thus maintaining the pipes and connections in a plumb state. He said it was the Company's practice to pipe a consumer's house at its own expense, in order to retain control and to see that the work was properly done. Sometimes, though, the consumer was asked to pay a portion of the cost of the riser pipe, which connects with the house pipe, and it was upon these risers that the device of defendant was usually placed. Witness declared that in making the desired connection the owners of the governors often broke the Gas Company's seals and locks, frequently bending the pipes, and occasionally breaking them, whereupon annoying and at times dangerous escapes of gas took place. In fact the complaints of consumers regarding leaks were often traced directly to the overt acts of defendant. The Secretary of the Company, Mr. C. L. Holman, in his testimony unhesitatingly declared he personally knew of several complaints of leakage and lack of pressure due to the governor attachment. On one occasion he went to a certain house on Olive street, on invitation of the Gas Consumers' Association, to witness the attaching of a governor to one of the Gas Company's meters; that the workman broke the seals and looks and pipes of the Company, that the witness was obliged to compel the workman to stop. He positively declared that hundreds of complaints on account of irregularity in gas supply were registered that were altogether due to the device of defendant and its placing. Mr. A. J. Sands, for the Gas Company, testified in similar strain, as did Mr. Hugh McArdle, of the Company's inspecting force, and Mr. W. S. Reger, the Company's Superintendent of Meter Inspection. Several gas meters, with and without the meter attachment, were shown in Court. The principal witness for the defendant was Mr. S. S. Foster, its St. Louis Manager, who declared that the work of attaching the device was always done with care and precision, and under his ultimate inspection and stamping. His main point was that in every instance where leaks or other disturbances to the consumers' flow of gas had occurred following the placing of the pressure curbing device the consumers' pipes and fittings were so worn out or inadequate that the blame for continuing such was undoubtedly on the Gas Company. Mr. W. James, an expert on the payroll of the Association, testified as to the method of making tests, etc. Much more testimony for and against was taken, and when it was all in Judge Fisher ordered the attorneys on both sides to file their briefs within 20 days. In 1903 the regulators set numbered something over 2,200, which number had since been reduced to 1,984.

CURRENT COMMENT.—

THE Executive Committee of the Utah Light and Railway Company, of Salt Lake City, at a meeting held some days ago, decided to completely rebuild the gas plant which it operates. The scheme contemplates the erection of a gas plant up to an output of 1,000,000 cubic feet per diem—the output of the present works will not exceed 300,000 cubic feet—and a great extension to the main system. The expenditure is estimated at $500,000.

MR. L. A. VON BEHREN, Manager of the Marion (Ind.) Gas Company, is anxious to know whether there is any validity in the contention recently urged by the City Council that the Company under its franchise has the right to raise the selling rate when it supplies artificial gas for fuel account.

COMMISSIONER DEFFENBAUGH is in the market for the purchase of the photometrical outfit necessary to the proper testing of the gas supplied by the Lincoln (Neb.) Company. The ordinance creating the position of official gas inspector was passed some time ago.

A FRANCHISE for the operation of a gas plant at Natchez, Miss., has been granted to J. S. Chichester and associates, of Chicago, Ills. It is specified that the initial selling rate shall not exceed $1.15 per 1,000, and the life of the grant is put at 20 years.

MR. LOUIS GOLDSTEIN has retired from the service of the Joliet, Ills., Company.

THE franchise of the Citizens Gas Company, of Tamaqua, Pa., has been extended, under the condition that the borough is to receive 1 per cent. of the Company's gross receipts for the first period of 5 years, and 2 per cent. for the second 5-year term.

PRESIDENT L. R. DUTTON is, and with good reason, well satisfied over the heaping measure of success which attended the gas economy demonstration of the Jenkintown and Cheltenham Gas Company at Wyncote, Pa., the first week this month. The "demonstration" was liberally patronized, and an unique feature of it was the awarding to every tenth visitor to the exhibition that paid the November gas bill the choice of a gas heater or a Welsbach light, as a souvenir. The "choice" usually ran to the selecting of a Welsbach.

THE contract for the 3,000,000 storage holder at Grand Rapids, Mich., was signed last March, and the vessel was successfully put into commission the 1st inst. Which would indicate quick work on the part of the contractors.

[AS FURNISHED BY THE OFFICIAL STENOGRAPHER.—Continued from page 1024.]

PROCEEDINGS, FIRST ANNUAL MEETING, THE AMERICAN GAS INSTITUTE.

HELD IN THE AUDITORIUM HOTEL, CHICAGO, ILLS., OCTOBER 17, 18 AND 19, 1906.

FIRST DAY—AFTERNOON SESSION.

REPORT OF THE BOARD OF REVISION.[1]

THE MECHANICAL ASPECT OF GAS DISTRIBUTION.

Protecting Mains from Frost.—For the prevention of stoppage by frost it is desirable that fittings and angles be done away with as much as possible.—Dunbar, J. W.—Q. B., W. G. A.—'99.)

"And that the pipe crossing a bridge be enlarged; for instance, if the main is 4-inch and it is enlarged to 8-inch when crossing a bridge, this will probably obviate the trouble."—(Geo. McMillan.—Q. B., W. G. A., '99.)

Protective Coatings for Pipe.—The thickness of metal employed in making cast iron pipe, and also the character of the metal, render it less liable to corrosion than is either wrought iron or steel. For this reason cast iron pipe is very seldom given a protective coating. When such coating is given, however, it should be applied in such a manner as not to get into the joint space, for gas is liable to dissolve the coating and cause a leak. The preservation of both main and service pipes from injury, either from corrosion by acids in the earth or by the action of electrolysis, is a subject that has merited much consideration and is productive of many opinions, it being sometimes affirmed that the cost of the protection is greater than is warranted by the increased life of the pipe.—(Simpson, '04.—Q. B.—No. 116.) (Von Maur, '04.—Q. B.—No. 118.)

There seem to be 3 methods in general use for protecting pipe: Galvanizing; coating with a coal tar preparation, or surrounding by coal tar concrete; coating with cement or surrounding with cement concrete.

The first method does not meet with general favor, it seeming to be the general opinion that the zinc coating was not of any permanent benefit.—(T. D. Miller, Peoria Gas and Electric Co., '03.—Q. B., No. 103.)

Coating with a coal tar preparation applied with a brush is recommended for the prevention of corrosion. Undoubtedly the preparation and application of this coating have something to do with its permanency and effectiveness. If the coating is not perfect the corrosion will begin at the cracked or defective place and work back under the coating, thus annulling all the benefit. It is said to be important that all the acids in the tar are eliminated. This is hard to do. Favorable results have been obtained both from the application of hot coal tar into which has been stirred lime to neutralize the acid and also from the application of Hickenlooper coating, the specification for which is as follows:

Bring a kettle of tar (20 gallons) to a low boiling point and add 20 pounds of fresh slacked lime, sifted over the top and worked down. Boil down to a paste of a consistency midway between tar and pitch. Let it settle for a few minutes, then add 4 pounds of tallow and 1 pound of powdered resin. Stir until they are thoroughly dissolved and incorporated into the mixture; then let cool. When ready to use, to each 45 gallons of the above add 4 pounds of crude rubber dissolved in turpentine to the consistency of thick cream. Heat the mixture to about 100° F., and apply to pipe heated to about the same temperature.—(AMERICAN GAS LIGHT JOURNAL, Vol. 65, p. 886.)

Different methods have been adopted for applying the mixture, the pipes being dipped in some cases and painted in others. Mr. Humphreys said that the best way was to dip the lengths of pipe into the preparation. In this method the mixture is put into a V-shaped trough which is long enough to take the longest length of pipe that is apt to be handled. Along the bottom of this trough is run a steam pipe to heat the mixture to the proper temperature. The pieces of pipe to be coated must also be heated, which can be done either by connecting the pieces to a steam pipe and turning steam on them, to give them a test of soundness while they are being heated, or by putting them in a long, square box with a hinged cover, the interior of the box being kept hot by means of a steam coil run along the bottom. When pipes are heated to the proper temperature they are plugged at both ends, to prevent any of the coating from getting on the inside, and are dropped into the hot mixture in the trough. After a few minutes they are taken out, placed on a rack over the trough until the excess of the mixture has dropped off, and then transferred to a drying rack in which they are left until the coating becomes thoroughly dry and hard. Care must be taken to keep the pieces from touching each other before they are dry and hard, since if

1. Continued from page 1024.

this is not done they will stick together and when pulled apart the coating will stick to one pipe and a bare place will be left on the other. Care must also be taken not to get the mixture or the pipe too hot, since overheating will drive off the more volatile portion of the preparation, and when the coating cools it will be brittle and liable to chip off. If the proper precautions are taken and fresh portions of the mixture added from time to time to that already in the trough, the coating will be elastic and will cling very tightly to the pipe. The service gang should, however, be supplied with a pot of the preparation, so that after the service is laid the spots where the coating has been scraped off by the tools can be re-coated before filling in the ditch. In some cases the pipe as it lies in the ditch is covered for its whole length with an extra layer of the coating, which forms a roof over it. The following formula for coal tar paint is recommended:

Coal tar	8	16
Portland cement	1	4
Kerosene oil	1	3

This was found not to injure iron or steel, and the range in mixture is between the above proportions. It will stick to galvanized iron and costs 10 to 15 cents per gallon. It is particularly adapted to salt water, the cement neutralizes the acid of coal tar and the kerosene oil acts as a dryer. The cement is slowly stirred into the kerosene first and this mixture stirred into the coal tar. It should be freshly mixed up and kept well stirred when applying. (A. C. Cunningham. *Engineering Record*, July 28, '06.)

The above mentioned protections are not recommended for electrolysis. As a protection against both corrosion and electrolysis, it is recommended that the pipe be surrounded with a coating of tar concrete, the tar and the gravel, sand or stone to be thoroughly dried and mixed and applied perfectly hot, the pipe to be laid in a wooden trough containing the mixture.—(Humiston, '04; Q. B., No. 118.)

"In Grand Rapids, Mich., about 1899, I began experimenting with the above method of laying service pipes. Later on we adopted it as general practice—which is still in force. We had but little trouble there from electrolysis. This is believed to be largely due, however, to the Street Railway Company providing ample and proper conductors for their return current, and our belief is supported by the fact that a great many uncovered service pipes installed previous to 1899, are apparently as free from electrolytic action as are the covered pipes." —Walbridge, '03; Q B., No. 101.)

"A coating about $\frac{1}{32}$ inch thick, of either California, Trinidad, Gilsonite, or Bermudez asphaltum, combined with petroleum residuum and sulphur, is prepared in the same manner. The petroleum residuum is to be heated to 300° F., 3 per cent. of common sulphur added to it, the same to be cooked to 300° F. until the sulphur is thoroughly incorporated with it; then sufficient of this mixture to be added to the melted asphatum until the asphaltum is of such consistency that it will not become too soft or run at 120° F., or crack when struck with a hammer at a freezing temperature. The pipes should be dipped in this composition at a temperature of about 225° F. In being laid, if the composition should in any way be removed or damaged, sufficient should be put on with a brush, hot, after the pipes are connected. This composition is said to make a perfect insulation proof against electrolysis."—(Watt, '04; Q. B., No. 118.)

"Boiled tar is as good as cement for protective purposes at a very much less cost. Make a trough a little larger than the size of the pipe to be laid; boil the tar to a consistency nearly of pitch; fill the trough with the mixture. It is an absolute prevention of electrolysis."—(Aldrich, '04; Q. B., No. 118.) One of the chief objections to this or any other covering in which a viscous base like tar is used, is that there can be no certainty that it will stay where it is laid.

"All our services laid under street car tracks in 1904 were laid in pitch as follows: A square box made of 1-inch undressed lumber, 1 inch larger than the outside diameter of the pipe, was laid in the trench, extending 3 feet beyond the outside rails; in the bottom of this were placed, 6 feet apart, small pieces of wood 5 inches thick, to keep the pipe off the bottom of the box and allow the pitch to get under the the pipe. When the service was so far advanced, the ends of box were closed with clay and hot pitch poured into same until filled to the top, no cover being used on the box, as no filling was done until the filling had cooled. The cost of laying in pitch was only $2 each more than others of the same length. This I believe to be the true solution of the problem of protecting service pipes from electrolysis and bad soil. But the service would be better boxed from main to curb or stop cock; this, of course, would add a little more to the cost. I fully expect to see all services laid in Milwaukee in the future protected in the above manner."—(Gas Distribution in Milwaukee.—Bryce MacAdam, *Pro. Age* —March 15, 1905.)

In general, a cement was considered an excellent preservative of iron or steel, and it has been used on the inside of an iron vessel where no oil paints would stand and has been wholly successful. Not all cements are adapted to this method, as the presence of certain chemical constituents and the absence of others is necessary to make such a coating effective. (Lloyd, '03.; Q. B., No. 127; Humiston, '04.; Q. B., No. 117,).

It is believed that cement coating of about ¼ inch thickness will entirely overcome electrolysis.

"Gas pipes laying next to cement covered water pipe, the water pipe was not damaged at all, while the gas pipes gave more or less trouble from electrolysis." (Shattuck, '03.; Q. B., No. 127.) "In order to be a perfect protection against electrolysis, the cement must be free from cracks. The thickness, therefore, will vary with the size of the pipe and the manner of laying same." (Lomax, '04; Q. B., No. 116)

"In actual practice it is almost impossible to get a perfect coating of cement. The writer has removed a great many services which had been cement coated for over 10 years. Where the cement had adhered the protection was perfect, but there was no section over 5 feet long where the adhesion was perfect—rust, dirt, or something else had made imperfect the contact so that the pipe was pitted and the value of the entire coating destroyed."—(Mastin Simpson.)

"It seems as if clear cement were considered a better protection than concrete. It is presumed that by the word cement is meant a concrete of one of the better brands of Portland cement. Such an envelope is not an absolute protection against electrolysis. Its efficiency would depend on the proportion of cement employed, the intimacy of the mixture and the amount of moisture in the soil in which the pipe thus protected was laid. With aconcrete 1 inch thick of 1 part high-grade cement, 2 parts of sand and 3 parts of ½ inch stone mixed and laid carefully, it is not believed that an efficiency above 60 per cent. could be secured. By this is meant that a pipe so protected and subjected to the same influences as a bare pipe would last 2½ times as long as the bare pipe. Such construction for a 4-inch wrought iron pipe would cost $11.70 per 100 feet; assuming that cement, sand and stone cost respectively, $2.25 per barrel and $1.60 and $1.50 per yard, and the common hemlock lumber for a 1-inch wood box cost $17 per 1,000. It would be necessary to use the box, as without it the mixture could not be tamped with sufficient firmness about the pipe." (Humiston, '04; Q. B., No. 110.)

Another method advocated is to construct a cheap trough which is placed under the pipe after it is laid in the trench, and the pipe is held centrally in the box by small pieces of brick or briquettes made from the cement.

"It is found necessary to have this coating on the pipe not less than 1 inch in thickness for any size up to 2-inch pipe, this thickness being required to prevent cracking. It is advisable to use the very best grade of cement. Much of our pipe (for Pintsch gas) is naturally laid in railroad yards and frequently through cinder filling, and we find this coating not only withstands the corrosive influence of such filling, but also is a good protection against stray electric currents." (J. A. Dixon, '03; Q. B., No. 127.)

Main Records.—"It has been suggested it is quite important that a record be kept of all new mains. The measurements for this record should be made before closing the trench. It is advised to cut a mark on the curbstone opposite each fifth bell showing its location and direction. Where several cement joints are made to one of lead, this mark is best cut opposite the lead joint. The marks are of an advantage when barring for leaks, recaulking mains, etc., and it is especially convenient to have some such indicator of each dead end for use when extending lines of pipe." (G. T. Thompson; W. G. A., '95.)

It is further suggested that whenever main work is to be executed a written order be issued, giving the foreman his instructions. To make it easier for the foreman, and to give him a better idea of his work, a sketch should be attached to this order showing the actual conditions as they exist at the time, giving him the mains and locations on the street to be worked on and also mains crossing the street. As many details are given as possible without making the sketch too complicated. This has been found to be very useful and a great saver of time, money and explanations. (G. S. Hessenbruch; *Pro. Age*, July 1, '05.)

It is also suggested that all measurements for street mains should be made, not only from the curb, but also from the property line as the property lines are not so subject to change as are the curb lines on a street.

Refilling Trenches.—In refilling trenches, dug for either the laying of

mains or services, the dirt should be put back in such a manner as no to force the pipe to one side of the trench, the men working with railroad tamping bars in pairs from opposite sides of the pipe. Trenches dug for the laying of mains with cement joints should not be refilled until the joints are set, as the tamping of the earth is liable to jar the pipe and crack the joints. The dirt should be well tamped on both sides of the pipe at the same time, and not more than from 3 inches to 6 inches of dirt, according to its character, should be placed in the trench at any one time. Custom, as well as good business policy, would indicate that all openings in the streets or alleys should be left in as good condition as found. The dirt should be thoroughly tamped back in place. In some places it is allowable to settle the dirt by flushing the trench with water, but as this softens the bed on which the pipe lays, it may cause the pipe to settle unevenly and is, therefore, not considered the best practice. Sometimes the dirt removed cannot be used for refilling on account of the presence of ashes or because the clayey nature of the soil will not let it settle properly. In such cases, the dirt should be removed and the trench refilled with sand. Some city ordinances specify that this method of refilling should be followed in all cases. If the street is paved, a proper foundation should be provided for the pavement, and in most cases a concrete base is preferred, even when other bases have been originally used, as the use of the concrete base forms a better foundation for the pavement and it will not be liable to settle. ('04, Q. B., No. 101—Enright, Philo Jones, Cobb, Walton Forstall, Whipple, Frank Hellen.)

Testing Mains.—New mains should be tested for tightness before being covered. When the piece of main being laid is an extension of an old main, it is usually connected to the old main and the test for tightness is made with gas pressure. After such a length has been laid as to warrant going to fill in and close up the ditch, the open end of the pipe should be tightly plugged and pressure allowed to come on the new pipe by removing the bag or stopper by which the gas was shut off.

In case the connection has not been made to the new main, a temporary connection to supply gas for testing may be made. Each joint should then be painted with soap suds and examined for leaks which will be indicated by bubbles at the point of leakage. Especial attention should be paid to the bottom of the joints. Any joints found to be leaking must be gone over and again tested. When all are tight the ditch can be filled in. Where gas pressure is not available, or even in some cases where it can be had, but a test at a higher pressure than can be obtained from it is desired, the pipe is put under an air pressure by pumping air into it until a pressure of 2 or 3 pounds—equal to 4 or 6 inches of mercury—is reached. The joint should then be examined for leaks as described above, and the pressure watched to see if it holds up. Indications afforded by the steadiness of the pressure are liable to be rendered worthless by change of temperature, and the temperature conditions must be noted and allowed for, when the hold up of the pressure is relied on as the sole means of determining the tightness of the pipe, and for certainty it is necessary to examine joints in each case. It has been suggested, by A. J. Vanderwhite, *Pro. Age*, Oct. 2, '05, that the portable compressed air apparatus used for testing gas pipes under pressure could be used for supplying air under pressure to pneumatic tools for cutting pipes and caulking joints. The testing of gas mains under higher pressure than that supplied by the gas need not materially increase the cost of making cement joints. Cement joints on large mains may, with proper organization, be tested and filled in 24 hours after the pipe is first laid, if necessary, and if the joint is properly made it may even be tested in a shorter length of time than that. The test is used more to detect defective castings than defective joints, for if the joints are properly made up and good cement used the leaky joints will be very few and the cost of cutting and replacing these joints will be very small in comparison to the total number made.—(Question No. 512.—Q. B., '06.) (Cadwaller, Gillingham, Goudy, Forstall, etc.)

Other Pipe.—In addition to the ordinary bell and spigot cast iron pipe, a pipe is made with a ball and socket joint. This is not used in ordinary practice but only used where great flexibility is desired; as, for instance, in crossing the bed of a stream.

In English practice a cast iron pipe is made, the following description of which is given by Bryce MacAdam, *Progressive Age*, March 15, '05.

"I think it is far ahead of our bell and spigot pipe and I would gladly welcome its introduction. The hub is slightly deeper than that made in this country, the inside of which has a projection 2.5 inches wide, beginning at back of hub; this is turned off with a perfectly smooth surface. The spigot has no head, but is cast with a projection conforming to that of the hub; this is also turned perfectly smooth on

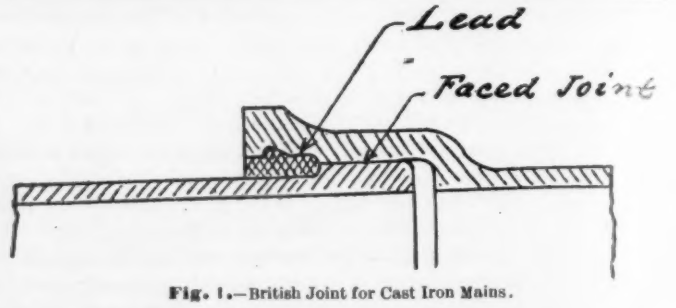


Fig. 1.—British Joint for Cast Iron Mains.

the face or surface and fits snugly into the hub. When about to lay the pipe, the faced parts are coated with a mixture of red lead, white lead and oil, the spigot end is carefully entered into the hub and driven home with a block of hard wood, by pounding on the hub of the length just laid until within .5 inch of being home. The pipe when thus laid is almost perfectly gas tight, but a lead joint is also run in the usual manner on the part of the hub not taken up with the turned and bored joint. No yarn is used, it is not necessary. In case of larger sizes after the pipe is properly entered, it is left there until another length is lowered into the trench and this length, while still hanging in the sling, is used as a ram to send the other length home."

Cast iron flange pipe is also made, but it is not used for street mains. Flange joints allow of the easy removal when desired of any one of the various pieces of pipe. They are, however, very rigid and, on long street lines of flange pipe, one or more expansion joints should be provided to relieve the pipe of the strain that would be thrown upon it by its expansion and contraction under the influence of the temperature. The following cements are offered for use in connecting up flange joints: Take ordinary pine tar and mix it with dry oxide of iron. This putty will make as good a joint on a faced or rough flanged joint as red lead putty at 1-tenth the cost. It will harden as soon as red lead, but is very adhesive under pressure.—(Geo. Light; O. G. L. A., 1902.)

Litharge joints are made by mixing litharge with commercial glycerine to the consistency of a thick paint with which the threads are heavily coated and then screwed tight. It sets quickly from a few minutes to a few hours, depending upon the consistency of the mixture and the age of the litharge. A thick mixture and fresh litharge set very quickly and a thin mixture and old litharge set much slower. Only a little should be mixed at a time and, after once mixed, it should not be stirred again or else it will never set.

Red lead and white lead joints are made by either using the ready mixed lead paints, or by mixing the powdered lead and boiled linseed oil. Both will not set, but just dry up like any other paint. The respective merits are that litharge makes the best joint for all purposes where the pipes are not subjected to jar. It is not affected by heat, cold, water, gas or acid and is extensively used for ammonia work and for high pressures. The joints are very hard to disconnect after the litharge becomes hard. Lead joints answer for all common work on water, steam or gas under ordinary pressure. Oil alone or asphaltum will do the same, and if the pipe threads do not fit the fittings, no material whatever will make a tight joint.

Red and white lead mixed to a soft putty make the hardest joint; white lead is too soft by itself. Litharge will not set so hard or as quickly as red lead.—(Bertsch, Bundy, John Witten, England.—O. Q. B., '05; No. 561.)

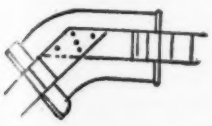
The "Universal" pipe is a modification of a flange joint allowing greater flexibility. The experience regarding the use of this pipe so far is not conclusive.—(Nos. 497 and 515.—O. Q. B., '05.)

Cast iron pipe is now also made with plain ends and put together by a rubber coupling of the Hammond or Dresser style. It seems as if this would make an ideal main, but no figures are available either regarding costs or results. A substance called lead wool for caulking joints on cast iron bell and spigot pipe is now on the market, but it has not been used for sufficient length of time to determine its usefulness. It has the advantage of dispensing with the pouring of the hot lead, the joint being driven cold. It is claimed to be as cheap as the joint made in the ordinary manner.

A fiber or paper gas main has also been tried. The use of this pipe has not been found satisfactory, as the life appears to be very short. The cost is just about the same as the cost of iron pipe.—(Copley and A. S. Miller; W. G. A., '06.) (Keys and Waters, O. Q. B., No. 505; '05.)

Checking Length of Bends.—To check the length of ¼ and $\frac{1}{16}$ bends, nail 2 strips of board together at the proper angle, and from the drawings mark on one leg the proper position of the face of the bell and on the other the end of the spigot. Lay the board on the side of the special

over the center and a glance will show if the length is according to specifications or not. Lines may be drawn on this same contrivance for all the sizes.—(R. C. Griswold.—O. Q. B.; '06.)



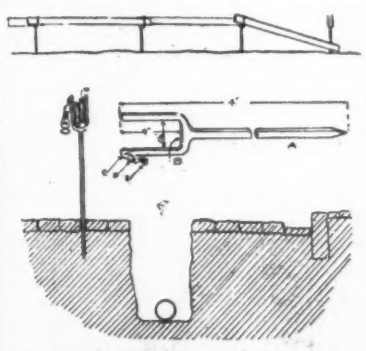
Impromptu Resistance Meter.—Donald McDonald thus gives a description of a device for measuring the amount of gas, air or steam passing through a pipe without a meter. "This device is called a resistance meter and is constructed as follows: The pipe is parted at any convenient point and a sheet iron diaphragm inserted, the diaphragm containing one or more holes of known size. The size of these holes must be governed by the amount of resistance which can be produced in the pipe without inconvenience. The pipe is then tapped on both sides of the diaphragm which causes the resistance, and ¼-inch pipes are then led to any convenient point for taking observations. When the two pipes are joined by rubber tubes to the two ends of a U-gauge filled with water, the reading of the U-gauge will always show the amount of resistance which the diaphragm causes to the flow of gas through the pipe. By taking and recording frequent observations of this resistance, the daily delivery can be very closely ascertained, while for the purpose of ascertaining instantly just how much gas or air is actually flowing through, the device is a better one than any other form of meter. We have used a device of this sort for the last 10 years and have always found that it is exceedingly convenient and always accurate. For the information of anyone intending to construct such a gauge, I will say that a sheet iron diaphragm, with a circular hole 3½ inches in diameter, passing 300 feet per minute of carburetted water gas, will cause a resistance of 2 inches of water. If the resistance is multiplied by 4 the delivery will be doubled. With this for a basis, a meter can be constructed to meet any conditions of delivery desired and resistances can be tabulated that are likely to arise, and a table can be made up by means of which the resistance in inches and tenths can be read into cubic feet delivered per minute."

Bending Cast Iron Pipe.—"I send you the rough sketch of an old wrinkle, not in general use, for few there are that think of bending cast iron. My first attempt was at a lumber camp in Calaveras county. Our cook could not bake bread in the stove even on account of the crosspiece between the lids having become bent or warped so that it allowed too much cold air to pass over his oven. He asked me if I could straighten it. I thought that the same medium that bent it could unbend it; so, by putting it into the forge and getting it to a bright cherry red, then placing it on the anvil upside down, and with a gentle pressure from the sledge hammer, we brought it down straight again. So, when occasion required to swing around a curve with nothing but straight lengths of cast iron pipe to do it with, I have done this, building a fire around 2 or more pipes, as the case might be, letting them warp down until the center pier wall touches, then knock out your fire, using no water to extinguish it. I have made some pretty bends in this way for the Water Company, withstanding 150 pounds pressure. You pile your wood after the manner that a blacksmith heats his wagon tires."—(T. R. Parker.—"Prog. Age," Sept. 15, '04.)

Having occasion to remove some 200 feet of 12-inch main from its position on supports overhead in the works' yard the device of which a description follows was adopted to avoid the labor otherwise necessary in cutting out lead joints. The "basket" was formed from 3 pieces of old sheet iron; 2 of them, the end or front pieces, were alike, U-shaped, the inner semicircle fitting the outside of the main the outer one being some 10 inches greater in diameter; the edge was rectangular, about 18 inches wide, and bent to fit the outer edge of the front pieces, to which it was attached by "knees" of light iron, secured by rivets and stove bolts. A number of 1-inch holes were roughly punched in the bottom for draft, and handles were attached at the side, through which an iron rod or short piece of pipe might be passed across the main to hold the basket in place when in use.

It was intended to employ hot coke in "burning out" the joints but, owing to the small body of fuel and its consequent rapid cooling, this was not found satisfactory. Using dry wood, however, the lead was quickly melted. Whenever possible the lengths were drawn apart with screwjacks, but on most of the joints this basket was used, and proved very convenient and satisfactory. (G. T. Thompson, "Basket for Melting out Lead Joints."—W. G. A., 1894.)

Fence for Ditches.—In street work, when ditches have to be protected against passing vehicles, etc., the usual course is to make a more or less efficient fence out of barrels, planks, ropes, or anything else that is handy. Gas companies, however, constantly working in the streets, will find it will pay to cover this detail systematically with a better device than the heterogeneous arrangement above referred to. The



scheme shown in the cut, in use in Boston, Mass., commends itself for simplicity and effectiveness that it is herewith reproduced for the benefit of our readers.

In it, any desired number of iron or steel rods are made, pointed at one end, forked at the other, as at *A B*. These rods being driven into the ground at suitable distances apart, alongside of and parallel with the open ditch, form strong and secure supports for boards or planks dropped in the forks edgewise, to form a guard or rail.

"Guard Fence for Street Ditches" (Jno. Gimper; A. A. G. W., 1891, 1900).

Trusses for Suspended Mains.—In the running of pipe about a gas works and of mains about a city, it frequently becomes necessary to truss several lengths of pipe so they will be self-supporting. If the distance to be spanned is over 40 or 50 feet, it is best to call in the services of a professional engineer to design a suitable and economic truss—unless the superintendent feels able to do this for himself. If less than the above distance the trusses shown by the cut will be found all sufficient for the purpose and to be readily and cheaply made by a good blacksmith.

Fig. 1 represents two lengths of pipe, strengthened by a single tie rod. This has an eye at either end as at *E*, and is attached to the pipe by means of the clamps *A B*, shown in detail at *C*. The distance strut *D*, in the center, is kept in place by compression only.

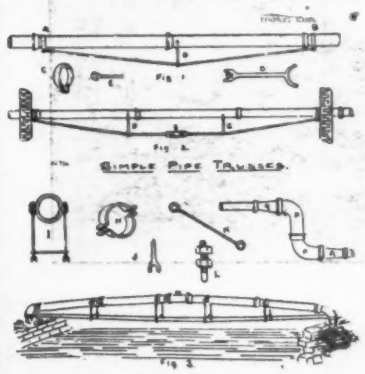


Fig. 2 represents 3 lengths of pipe, spanning, say, a driveway between buildings, trussed in the same manner but with 2 vertical struts *F G* and a "turnbuckle," *S*, for tightening up. Where this pipe is of a large size, 2 tie rods should be used, as in the next example. In this case the struts *F G*, will, of course, be in pairs, as at *I*, and the shape of clamps will then be as shown in detail at *H*. A horizontal rod *K*, of light, half-round iron, should be used at each pair of struts *I*, to keep the tie rods parallel and the right distance apart. The lower ends of the struts should be forked as at *J*, while the upper ends should be provided with 2 nuts each, as at *L*.

Fig. 3 represents this last form of truss, enlarged and supporting 4 lengths of pipe and a key-piece *M*, crossing, say, a canal of 40 or 50 feet in width. In detail this is like the others above, differing only in having an additional number of vertical struts and at the ends, clamps being attached horizontally around the riser elbows at *N O*. The dimensions, weight of iron to be used in rods, etc., must in each case be governed by the size and weight and span of the pipe of the individual case in question. Such work should be carefully laid out beforehand, and the following points remembered:

First; as such trussed pipe is under a slight strain, the lead joints should be made with unusual care and as deep and strong as possible.

Second; as the pipe itself is one member of the truss, in tightening up the turnbuckles *S*, care should be taken to just "take the weight" off the pipe without "starting" the lead joints.

Third; as such pipe is exposed, and subject to strain, unusual care should be exercised to select only sound and truly cored lengths. It is a good plan to use "extra heavy" pipe in this work. A few lengths of such can usually be procured of the local water company.

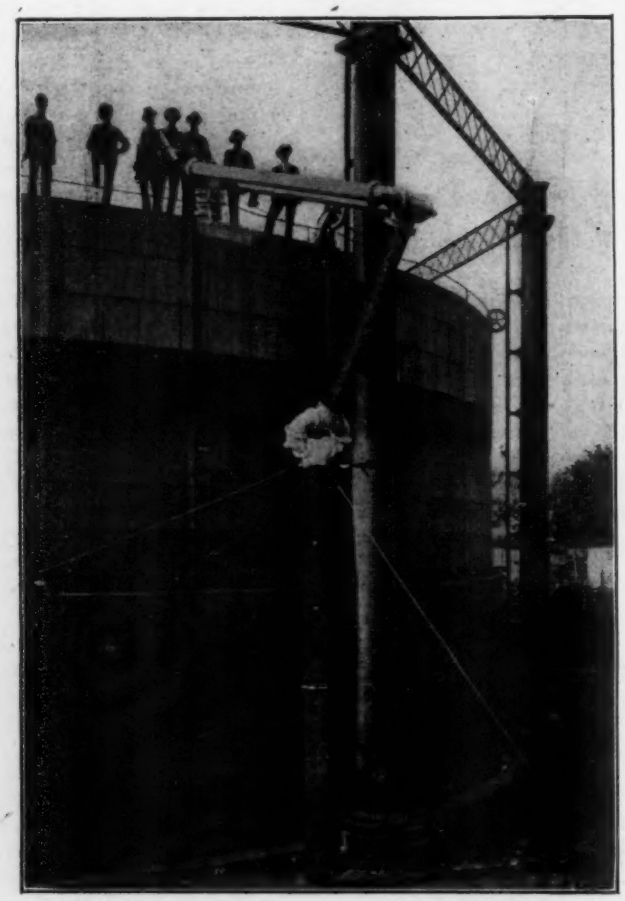
Fourth; if the riser elbows *P P* be made of 2 sizes larger pipe (connected by reducers *R R*) than the run of the pipe *Q Q*, there will be much less liability to deposits and stoppages of naphthaline, etc., in exposed places around bridges, etc.

Fifth; all such work should be well painted.

If it is desired to house in a trussed pipe of this sort from the weather, a suitable covering of wood, or of corrugated or sheet iron, may be made and may rest directly upon the pipe itself. After a trussed pipe is once erected, do not assume that it will take care of itself for all time to come, but make periodical inspections of it to see that all joints and nuts are tight, threads not rusting, etc. If this be done the life of

an iron truss will prove 3 times as long as a wooden one, and all attendant dangers of dry rot and sagging in the latter are avoided.—A. A. G. W., 1891, 1900.

Enlarging Holder Pipes.—It frequently happens that it is desirable to increase the size of the holder pipes, and excavation either under a brick or steel tank is not only an expensive and dangerous method, but



one that requires more time for the installation than can be afforded. In "King's Treatise," Vol. 2; 9, 195, is shown a flexible outside standpipe, of which design there are three examples in this country. The first was at Danbury, Conn., installed by Prof. H. H. Edgerton; 1 at Staten Island, of 12-inch cast iron pipe, and 1 at New Orleans, of 24-inch by 30-inch steel pipe. The latter 2 were installed by Mr. Fred. H. Shelton. We herewith reproduce a photograph taken of the installation made at Clifton, S. I., at which place Mr. Thomas C. Horton is in charge. The three flexible joints shown are made by the flanges of the elbows and tees being tongued and grooved and held together by bolts passing through the tees and through the elbows at the point where ordinary cleaning holes are provided. The first installation was made at Ivry, France, some 60 years ago. We are informed that no naphthaline trouble has ever been experienced with this method of articulated outside piping.

Cutting Cement Joints.—The heating of cement joints by building a fire around them will soften and break up the cement so that the joint can be readily cut out.

Booster Lines.—The rapid growth of cities has made it necessary to provide some means for the supplying of gas to the outlying districts. In many cases the mains originally laid for distribution were much too small. For this purpose a "booster line" is installed, this being a line running direct from the main distributing station or manufacturing plant to the outlying district, or it may even be a belt line encircling the town. The gas is forced through this line at a relatively high pressure, from 5 to 15 pounds being carried, the gas being pumped by either a rotary blower or a compressor, as circumstances indicate best. While some cast iron lines are used for this purpose, on account of the liability to fracture and the high leakage when the fracture occurs, the preference is for wrought iron or steel line pipe laid with screwed joints in much the same manner as that described in the "Laying of Wrought Iron Mains for Low Pressure Distribution," special care being taken, however, that the joints are made perfectly tight, the line being tested with compressed air to at least double the pressure it is expected to carry. Where the pressure to be carried will exceed 10 or 15 pounds, it is desirable to lay wrought iron line pipe, and in sizes 6 inches and larger pipe, with plain ends, using the Dresser or Hammond style of coupling. Originally the gas was pumped through the "booster line" and stored in a holder, afterwards being taken out of the holder through a larger one into the main distributing system. This holder should be provided with an automatic valve to shut off the supply when the holder becomes full, and also with an electrical connection which will indicate at the pumping station the height of the holder.

Governors.—The practice now is to dispense with the holder on account of the cost of installation, maintenance and operation, and instead of using the holder distribute the gas directly from the high pressure "booster line" into the main low pressure system, a governor being used to reduce the pressure. These governors are very sensitive and will readily reduce from 20 pounds down to 2 or 3 inches of water pressure, but where the pressure carried on the "booster line" is greater than 10 pounds, better results can be obtained by placing 2 governors tandem; the 1 governor reducing from the initial pressure down to about 5 pounds, the other reducing from 5 pounds down to the pressure to be carried in the mains. These governors should also be installed in duplicate so that, in case of the failure of one set of governors to act, the other can be depended upon. A convenient method of installation is to place the governors in a pit in the street. The governor pit described by Bryce McAdam, in "Gas Distribution at Milwaukee, 1905," is as follows: Our governor pits are 7 feet 8 inches by 12 feet 4 inches, with a 12-inch brick wall laid in cement mortar on a concrete bottom, 8 inches thick. The roof is concrete, arched on 9-inch beams, finished 4 inches below the grade, on top of which is laid a dry mixture of crushed stone and gravel, forming a macadam road. In one corner of the roof (nearest to where the gauges are) is placed a square manhole, with a locking device and counterbalanced so that, when the cover is unlocked and raised, it remains standing on end until again closed and locked. The work done so far has been entirely satisfactory and we will go on extending the system, as demanded by an increased business.

To insure perfect safety, an automatic seal or blowoff should be provided at each governor. These may be sealed off with either mercury or a non-freezing oil. On account of the expense oil is preferred for the larger size.

Cross-Country Artificial Gas Lines.—The consolidation of several gas companies under one head has made it convenient and economical in operation to place the main manufacturing plant in one town supplying the surrounding towns by high pressure lines laid across the country. These lines are operated under varying pressure from 5 to 50 pounds, about 30 pounds being the average. The gas is pumped into the lines by compressors which are arranged to run according to the demand, pulsation tanks being placed near the compressors to steady the flow of gas through the line. There is no storage other than the cubical capacity of the line. In some casees, however, it seems to be considered advisable to place reserve storage tanks at the further end of the line, these reserve storage tanks being wrought iron riveted cylinders, tested to stand a higher pressure than carried on the line, and having usually a capacity of 3,000 to 7,000 cubic feet of gas at from 30 to 50 pounds pressure. The gas being under pressure in these tanks gives some reserve and, flowing out of the tank in time of extra demand, aids in equalizing the pressure. The moisture in the gas is taken care of by means of extractors, consisting of a vessel containing a series of baffle plates placed near the compressing station. In addition to this, drips with blowouts are placed in the hollow places nearest the pumping station, usually 2 or 3 feet beyond the lowest point in the direction in which the gas flows. These drips are blown out at stated intervals. When this method of distributing gas was first inaugurated there was some fear that the compressing of the gas would cause some depreciation in candle power or quality of the gas. These fears do not seem well founded, as recent experiments have shown that while there may be some depreciation it is not appreciable enough to effect the quality of the gas. The pipe used in installations of this character is preferably wrought iron, screwed pipe for the smaller sizes and wrought iron, plain-end pipe, using the Dresser or Hammond coupling for the larger sizes, 6 inches or over. The use of the Dresser or Hammond couplings enables the pipe to be laid very quickly, makes an absolutely tight joint, and in case there is no fear of corrosion a lighter weight pipe may be used with these couplings. If cast iron fittings are used they should be of the extra heavy type used on natural gas cross country lines. Gate valves are placed at convenient points in the line so that in case of a break, any section can be isolated. The line is tested by compressed air furnished by a compressor driven by a gasoline engine or electric motor mounted on a portable testing rig. When leaks are found which cannot be screwed tight or caulked they are repaired with

a leak clamp of the Hammond style. The practice of protection from corrosion now in use for low pressure distributing systems is being applied to high pressure lines. The gas is supplied from the high pressure to the low pressure system through regulators placed in much the same manner as are those for "booster lines" in the larger cities. One advantage of a high pressure installation of this character is that, if deemed advisable, high pressure services may be taken directly from the line as it goes across the country, and where the consumers are scattered over a great extent of territory, branch mains may be laid, small in size, say 1¼-inch or 1-inch. These mains feed directly from the high pressure system. In this case each consumer is equipped with an individual governor and a safety blowoff. The services are usually either ¾-inch or ½-inch in size, screwed directly into a tee which was placed in the line when it was being laid, or else the connection to the main line is made by a combination tee and saddle piece, having a lead gasket. It will be noticed that, on account of the decreased sizes of mains and services, the cost of an installation of this character will be much less than that of the ordinary kind. Neither mains nor services need be graded, as there is no condensation to be taken care of.

The governors reducing the pressure for a town system should be in duplicate, and may be placed in a pit or in a governor house built for that purpose. In either case they should be placed in a position readily accessible for cleaning and repairs, and should receive periodical attention, as a slight wearing of the seat or valve will cause quite a difference between the normal working and the actual closing off pressure.

(For an extended discussion, see H. L. Rice on "High Pressure Gas Distribution of To-day."—A. G. L. A., 1905. For further notes on cross country lines, see Natural Gas Section.)

The following wrinkle is given as a suggestion for the connecting of services and individual governors:

"To install a high pressure service, it has been necessary at the main to use a saddle, a corporation cock and 2 street elbows, raising the service some 8 or 9 inches above the main, making a connection that was more or less weak and one that was apt to break in cold weather. At the house end a complicated arrangement of pipe and fittings was required to properly connect up the governor and seal, and as this usually lay close to the meter considerable room was taken up. This method of connecting was not only unsightly but quite objectionable, particularly so if the service ran directly into the kitchen or living room, as is frequently the case where no basement exists. The combination saddle and tee *A*, permitting of a shorter and more rigid connection at the main, and the seal *B*, small and compact, because it is made to hold mercury instead of oil, are the only novelties in this wrinkle, but a comparison of the two drawings will show at a glance the superiority and neatness of one over the other. The opening at the top of the tee *A*, is for the purpose of inserting a wooden plug so that the gas can be shut temporarily until the curb cock is reached, when it is withdrawn and the plug replaced. In both drawings the services are made to appear as if they extended a foot or more in the basement, but this was done merely to show a little more clearly the position of governor and seal. In practice the whole connection is twisted and crowded into a more compact mass, so that it does not occupy as much room as indicated.

"Both the saddle and tee, I am told, were designed by Mr. Johnson, formerly of Hammond, Ind."—(Lester F. Price.—Western Gas Wrinkles, 1905.)

Natural Gas Long Distance Lines.—The distribution of natural gas from the place of production to the place of consumption has become quite a business within the last 10 years. In many cases the point of production is many hundred miles distant from the point of consumption. In some cases the natural pressure of the wells is sufficient to force the gas through the line, but in a large number of cases the gas is forced through the line by means of compressors driven by steam engines, the steam for which is furnished by boilers, using either natural gas or coal for fuel, or the compressors may be driven by natural gas engines. In some cases those engines are direct connected to the compressors; in other cases the power is transmitted from the engine to the compressor by a belt. As each pumping station is so situated and the circumstances surrounding it are such that it becomes a problem in itself, this makes it necessary that the size and kind of compressor, the speed at which it should run, and the power which should operate it are problems which must be studied by an expert in that line and determined for that individual case. It is impossible in any article of this kind to give any rules or description which will be of any direct advantage.

Surveying the Line.—The cost of material and labor on a cross country natural gas line is such that it is necessary the shortest possible distance be taken; in consequence of this a survey is usually made of the line. This survey takes as straight a line as possible between the pumping station or point of production and the city or town where the gas is to be consumed. After this survey has been made by an engineering corps, the practical pipe layer having experience in the business is usually sent over the line to determine what deviations from the straight line are necessary to make good work. This man takes notice of what creeks and rivers are to be crossed and determines the best possible point for crossing the same, as there is always some danger of a freshet or high water washing out the line and possibly putting the line out of commission at a time when it is most needed. Inasmuch as the high pressure carried on these lines makes the danger from leakage more pronounced than common, it is well also to keep the line as far away from any building as practicable. After it has been determined on what line the pipe should be laid the right-of-way men are sent out to secure the right of way through the land over which the pipe goes.

Pipe Used.—At this time, too, the pipe is ordered for the line. As the pressure decreases with the distance traveled by the gas from the point of production, in order to convey the same quantity the pipe is enlarged; for instance, at the point of production the line may be 6 inches. This may be enlarged successively to 8 or 10 inches, and finally, at the point of consumption the conveying line may be 12-inch diameter. Some high pressure lines have been laid, using the ordinary bell and spigot cast iron pipe with lead caulked joint; but this has not been satisfactory as the joints continually leak, the expansion and contraction in the pipe apparently loosening them up. Some cast iron pipe has been laid by using rubber couplings, and this would make an ideal line, since the cast iron pipe would be much less liable to corrosion than would the wrought iron, and it also costs less. The lower first cost, however, of the cast iron pipe is largely offset by the cost of transportation. The cross country line is often from 4 to 8 miles away from the nearest railway stations, and sometimes it is even a greater distance than this, and on account of the increased weight the cost of hauling the cast iron pipe is much greater per foot than is the hauling of wrought iron. For sizes 6-inch and lower, the preference of natural gas men appears to be for a wrought iron screwed pipe, commonly called line pipe. This pipe is a trifle heavier than the ordinary merchant pipe, and the thread on both the coupling and the pipe is made with a taper, so that the pipe screws up to a vanishing thread at the shoulder.

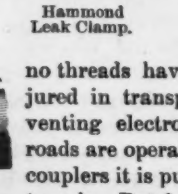
Laying Screwed Pipe.—The pipe is screwed together on top of the ditch and afterwards dropped in. In laying, the end of the pipe which is already in the ditch is elevated to about the top of the ditch on a jack or a skid placed across the ditch. The end of the length about to be laid is then inserted in the coupling of this length and the other end placed at a higher elevation on another jack, care being taken that both lengths are exactly in line. The pipe is then turned by the hands to start the thread. After the thread is started and the foreman is satisfied that it is not crossed, but is going true, the pipe men place their tongs on the pipe. Usually one set of tongs is placed on the pipe already laid as a hold-back to keep it from turning, and from 3 to 4 pairs are placed on the pipe to be screwed up. On 6-inch pipe it is customary to use 4 pairs of tongs to screw up, with 2 men on the handles of each pair of tongs. The foreman beating time with his hammer on the coupling enables the tongs' men to swing together on the tongs. After the length is screwed up tight the rear skid or jack is removed and the pipe is carefully allowed to drop into the ditch. The end of the pipe is then lowered on the first jack to about the level of the surface of the ground and the operation is repeated. One man is usually detailed to go ahead and inspect the threads and see that they are clean and that none of them are flattened. This man will put whatever dope is to be used on the thread. Any of the preparations enumerated in the section of "Low Pressure Wrought Iron Pipe Laying" will be found satisfactory; but heavy black asphalt varnish is commonly used. The uneven nature of the ground over which the pipe is run sometimes makes it necessary to bend the pipe in order to avoid a strain on the coupling; this bend also allows for contraction and expansion. In this case it is customary to build a fire of wood around the pipe; the pipe is then allowed to bend, usually by its own weight, so as to fit the contour of the ground. Care should be taken not to make too short a bend in one place. It is remarkable, however, how easily and how well an experienced man will bend wrought iron pipe of almost any diameter. It is customary to put in gate valves at stated intervals along the line, so that in case of a break any section can be isolated. A gate valve is also placed where each branch line is taken off from the main line for the purpose of shutting off the branch line should it be considered necessary.

Fittings Used.—In case cast iron fittings are to be used, they are of

an extra heavy pattern especially made for that purpose. In addition to the thread they have a recess at the end, so that in case of leak this recess is poured full of lead which is then caulked tight. It is not considered good practice to use bushings, as they are liable to become cracked or broken, but fittings are usually ordered in reducing sizes, or else the size is reduced by the use of a swedged nipple which is a short piece of pipe of the larger size drawn or swedged down at one end to the smaller size. If a leak develops at the end of a coupling which cannot be caulked tight it is repaired by the use of a collar leak-clamp. If the coupling is split and it is impracticable to shut the pressure off the line to make repairs, a split sleeve, which completely covers the coupling and extends each way beyond the ends, is used to make repairs.

Plain End Pipe with Couplers.—For pipe 6 inches and larger it is considered the best practice to lay plain end pipe, using couplings of the Hammond and Dresser type. This variety of joint is satisfactory in every way and has a number of advantages over the screwed couplings for the larger diameters. It makes a much tighter line, thus reducing loss from leakage. The cost of laying is greatly reduced, the cost of coupling the pipe and filling the ditch being only 20 to 40 per cent. of the cost with the screw pipe. It overcomes the trouble due to the expansion and contraction of the pipe lines without resorting to bends. It enables the pipe to swing more or less, it adjusts itself to the inequalities of the surface (this is especially true of the Hammond coupler), it cheapens the first cost because no threads have to be cut, it is not so easily injured in transportation, and is efficient in preventing electrolysis in localities where electric roads are operated. When pipe is laid with these couplers it is put together on skids on top of the trench. Ratchet wrenches made for the purpose are used to draw up the bolts of the couplings, care being taken that the bolts are drawn up evenly all around the joints. After the pipe has been made up the pipe is carefully lowered into the ditch. For this purpose it is convenient to have a horse made of 4 by 6 timbers with 2 by 4 legs very strongly braced. A series of these horses are placed across the trench. The end of a piece of 1-inch rope is fastened to the horse. It is then passed down around under the pipe, brought up again and a turn or 2 taken around the horse. After the skids are removed the pipe is carefully lowered into the ditch by playing out a little rope at a time, care being taken that the joints are all lowered evenly and are kept in as near a straight line as possible. If the joints are not lowered evenly the leverage of the pipe might crack the center ring and would be very apt to pinch the rubber on one side and force it out on the other. If a very heavy pressure is to be put on a line of this kind the line should be braced where fittings or bends are to be used so that the joint may not be forced out.

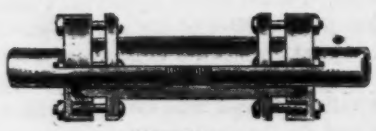
Dresser Leak Clamp.



Hammond Leak Clamp.

Hammond Coupler.

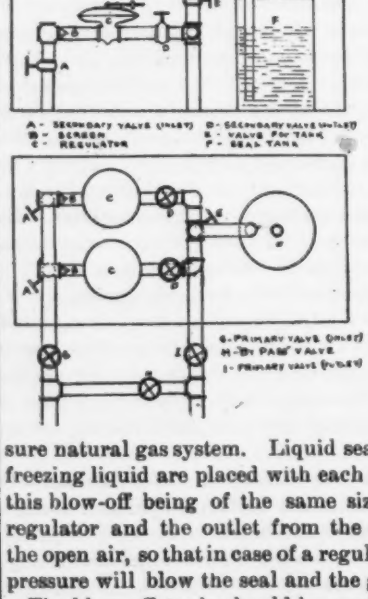
River Crossing.—In making a river crossing, if the river is not too wide, the pipe may be put together on the one side and pulled across, or in crossing wide and deep streams it may be laid from a scow. The river bottom should be sounded and excavated to secure as good a bed for the pipe as possible. The heaviest pipe is used and the joints are connected by a river sleeve. This sleeve is threaded in the center so that the pipe can be screwed into it, and in addition the ends are packed with rubber packing made tight by clamps drawn up with bolts. After the pipe has been properly bedded, hooks are driven over it to keep it in place.



River Sleeve.

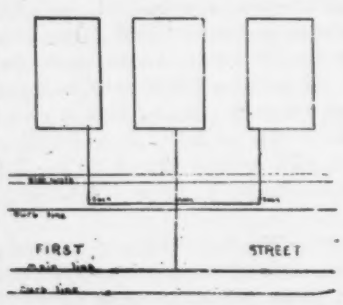
Testing the Line.—After the line is completed the gas is turned on, the dirt is blown out of the line and the line tested for leaks. Long lines are blown and tested a section at a time.

Regulators.—It is customary to place regulators at the city line. These regulators are usually placed in a regulator house and reduce the pressure to something less than 30 pounds for an intermediate line going through the city. Gate valves are placed outside of these houses so that in case of accident the gas may be shut off from the outside and the house isolated. The regulators in these houses are placed in duplicate, and besides this a by-pass is run across from the inlet to the outlet, back of the gate valves which isolate the house so that in case the house is shut out at any time the line may be fed through the by-pass. It is also convenient to place a cross in the riser pipe coming up from the ground to supply the regulator. A conical screen, inserted into the supply pipe through the end of the cross opposite the regulator, will catch the scale and dirt and prevent it from damaging the valves. If the shut-off valve is placed below the cross, the screen may be readily removed for cleaning. The intermediate pressure line is run into the city and regulators placed around the city in such situations that the gas may be fed evenly into the various parts of the distributing system. These regulators are also placed in duplicate and have by-passes in much the same manner as the high pressure regulators. They reduce the pressure from 30 pounds, say, to about 4 ounces, which is the average pressure carried on the low pressure natural gas system. Liquid seals or a blow-off sealed with a non-freezing liquid are placed with each set of regulators, the connection to this blow-off being of the same size as the outlet connection to the regulator and the outlet from the blow-off being conducted up into the open air, so that in case of a regulator failing to shut off properly the pressure will blow the seal and the gas will be blown out.



The blow-off tank should be made very large, so there will not be much danger of the escaping gas carrying out the oil and permanently unsealing it, a tank for a 6-inch blow-off being cylindrical in shape, about 3 feet 6 inches in diameter and 4 feet 6 inches deep. They may be made of heavy galvanized iron, the inlet pipe for the seal being carried down through the top to within about 4 inches of the bottom. A set of gauge cocks or a water gauge glass may be put at the side of the tank so that at any time the depth of the oil or the sealing fluid may be ascertained. It is customary to carry about enough seal so that a tank will blow at from 10 to 12 ounces.

Size of Services.—On account of the increased consumption of fuel gas at the present time, services for low pressure artificial gas plants are laid of much larger sizes than formerly. Almost all gas companies now use 1¼-inch wrought iron pipe, some 1½ inches exclusively, and very few less than 1.77 size for a service into the ordinary sized dwelling. The larger size pipe does not cost much more, is stiffer, and there is much less liability to trap or become obstructed in any way.



Manifolding Services.—The best practice is to put a separate service from the curb into each house. In case 2 houses are on the same lot, one in the rear, a branch may be taken for the first house and the service continued to the second, provided the tap is large enough to carry 2 houses and all parties agree.—(O. Q. B., '06; No. 586.)

In conditions that do not admit of more than one cut across the street, 2 or 3 services may be manifolded as per sketch, in which case the service across the street will of course be made large enough to supply all 3 consumers. It must be remembered, however, that a consumer is always better satisfied and less liable to complain of poor service if he has an independent connection.

Service Gang and Tools.—The service work is usually performed by a gang of men consisting of 1 or 2 fitters and 3 or 6 laborers under the direction of a foreman. On account of the time consumed going to the shop it is better to cut the pipe and do the fitting right on the job, and it has been found advisable to equip them with a wagon containing a portable bench and vise, also tools for cutting the pipe, some lengths of pipe and the necessary fittings. The following is the probable equipment of a gang:

Three sharp-nose, D-handle shovels; 1 long-handled shovel for tunnel work; 4 railroad picks with handles; one 3-foot 6-inch crow bar; 1 street broom; 1 tapping machine, ⅜-inch to 2 inches; one 12-pound sledge; two 18-inch and one 24-inch Stillson or Trimo wrenches; 1 each

12-inch and 15-inch Coe wrench; one 18-inch wall chisel; 1 hatchet; 1 wheel pipe cutter for vise use; one 3-wheel pipe cutter for trench use; 1 set caulking tools with hammer for setting up leaky joints; 1 can pipe coating with brush; 1 stock with dies for vise use; 1 ratchet stock and dies for trench and repair use; one 18-inch bastard file; 1 iron oil can with oil for same; 3 lanterns with red globes with oil for same; 1 small test pump with gauge; one 2-pound machinist hammer.

In case a bench is not carried, the vise may be arranged so as to be clamped to a telegraph pole with a chain, in the same manner as the tapping machine is clamped to the pipe. Some companies prefer push carts to wagons, in which case the vise is clamped to the tail of the cart, which is so arranged that when straightened up it can be blocked to make the vise available. "Where mains are laid at a standard distance out from the curb, and a curb cock is used, stop lengths—that is, lengths from the main to cock—can be with advantage made up in the shop and sent out with a stopcock on."—(Walton Forstall, '06, O. Q. B., No. 476.)

Otherwise it is not considered practicable to equip a service gang with cut lengths of pipe.

Service Records and Orders.—It is important that a complete record be kept of every service run. For this reason the foreman should be given a written order for each service. On the face of this order he should be given such information as would enable him to do the work intelligently. On the back of the order should be provided means by which he might readily make a sketch showing the location of the service with reference to the house and the street, mark the distances and give a memoranda of the pipe and the fittings used. The data on these orders when turned in by the foreman should be entered by some person either on cards or in a book kept for that purpose.

Connecting Services to Small Mains.—The use of large size services renders it impracticable to tap the smaller size mains. For this reason it is customary with a large number of gas companies to insert tees in whatever 2-inch main they lay wherever a service may be expected. These tees are inserted when the main line is laid. Even if a 2-inch main line could be tapped, the end of the service fitting, when screwed into the main, would project so far inside the main as to seriously obstruct the flow.—(Doherty, Simpson; '04, Q. B., No. 103.)

For this reason where a service connection is to be made to either 2-inch or 3-inch line where no tee has been inserted, it is preferable to make the connection by means of a saddle, drilling the hole in the main at least one size smaller than the service to be laid. In making a connection by means of a saddle, either lead, rubber, leather or white lead may be used to make the joint between the saddle and the main. Soft lead is preferred. If rubber is used it should be noted that the washer should not be very thick, otherwise it will soften and in time squeeze out from between the joint and obstruct the service.—('04, Q. B., No. 103.)

If, however, the connection to either a 2-inch or 3-inch line is larger than 1¼ inches, it is better to cut the line and insert a tee, using either the ordinary style of tee with nipple and long thread or else insert a Dresser or Hammond tee.—(Stone—Hellen, '04; Q. B., No. 103.)

Sometimes in tapping smaller size mains a split sleeve is used which is caulked on to the main; afterward the opening is tapped through the sleeve.

Using Swing Joints.—There has been much discussion as to whether it were advisable to use a swing joint in making connection to a main, or whether the connection should be made straight, but the best authorities approve the swing joint. In making a swing joint the opening at the main is tapped on top and at least one size smaller than the service to be run; for instance, for a 1¼-inch service, a 1-inch or ¾-inch tap may be made, the jet discharge being sufficient to fill the pipe. A reducing tee is then screwed into the main, then a street ell into the side of the tee making a swing. The top opening of the tee is used to insert a wooden or rubber plug to cut off the gas while the service is being run. This makes the operation safe while the work is still in progress, relieves the pipe of both vertical and horizontal strain due to settling or crawling, and makes it very much easier to renew or enlarge the service.—(Walton Forstall—Frank Hellen—Simpson, '03; Q. B., No. 128.)

Making Straight Connections.—Some authorities object to tapping on top and using a swing for the following reasons: Too easy to become obstructed, too liable to sag, and if a trap should occur in the service it cannot be cleaned out thoroughly and the service does not admit of being well blocked. These same authorities say that where the main is very deep a bend screwed into the top of the main should be used to bring the service to the desired elevation. Undoubtedly the fittings used in tapping on top and making the swing might cause an obstruction to the flow of gas unless of ample size; but in 6 cases out of 10 breaks occur where the service is screwed into the main and ths use of the swing joint in allowing for expansion and contraction makes breakage much less frequent, and there is no reason why the swing joint should interfere with the proper blocking of the service. It is thought advisable when a man is tapping for a service connection into a main that some other employee should be near to assist him in case of accident, and it is further suggested that, where the ordinary tap is used, the use of soap on the tap will largely prevent the escape of gas. In no case should a union be used to make a connection between a service and main unless the union is fitted with a lead washer, otherwise the washer is liable to shrink and the connection become leaky.

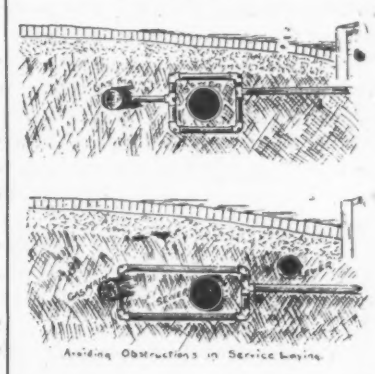
Grade of Services.—The minimum grade to which service should be laid is about 6 inches to 100 feet, and in case this minimum grade is used, great care should be used in laying the pipe. The ditch should either be carefully bottomed up or the service blocked so as to insure that there will be no settlement. ('03, Q. B., No. 110; and '04, Q. B., No. 120.)

Depth of Services.—No definite depth can be prescribed for laying services. They should be laid if possible below the frost line and also deep enough to avoid any trouble caused by the jar or vibration of traffic on the street. Usually 2 or 3 feet deep is considered sufficient. —(Simpson, Hellen, Shelton; '04, Q. B., No. 105.)

Stopcocks at Curb.—The increased use of larger sizes has made most gas companies favor putting a stopcock on the service line at the curb, and in case of very large sizes, 2 inches and over, when a number of meters are attached to the same service, it is considered by some gas companies good practice to put an additional stopcock just inside the cellar wall.—('06; Q. B., No. 493.)

The stopcock at the curb is preferably an all brass cock, and in order to avoid any breakage or leakage caused by strain it should be extra heavy, the average weight of a 1¼-inch cock now used being about 3 pounds. A cock having a cast iron body and brass plug is liable to break.—('06; Q. B., No. 477.)

It has been urged as an objection against stopcocks at the curb that the box is liable to be filled up or get out of place so that in case it is found necessary to get at the stopcock to shut it off or turn it on, the employees cannot do so and it must be dug up. While this objection may hold good, yet out of the total number of stopcocks in use, a very small proportion of them will be found in such condition that they cannot be used when needed.—(Young; W. G. A., '92.)



Getting Around Obstructions.—In case an obstruction is encountered which will not allow the service to be laid and have the proper fall, the service may be looped around the obstruction, the upper pipe of the loop supplying the gas, the lower one taking care of the condensation.—(O. Q. B., '05; No. 572.)

Service Fitting in Cellar.—It is good practice to put a tee on the end of the service which projects through the cellar wall, the side opening of the tee being used to continue the pipe for the meter connection—the end of the tee opposite the service is reduced to ¾-inch and plugged. In case of trouble this plug can be removed to admit connection being made to obtain the pressure or remove obstruction from the service, or if the service is frozen, a ¾-inch street elbow screwed into the opening enables alcohol to be poured into the service to thaw it out.—('06; Q. B., No. 530)

An old service that has been disconnected or unused for some time should not be connected up or the gas turned into it until it has been tested with a pump and gauge, as it may be rusted or broken and leak.

Coating Service Pipe.—A number of gas companies make a practice of coating the service to prevent corrosion and also to minimize as far as possible the effects of electrolysis. It is doubtful in the minds of some whether the increased protection is really worth the cost, at least on unpaved streets. It must be borne in mind that a coating to be effective must be perfect; that is, it must be free from cracks and must adhere to and form a close contact with the metal of the pipe at all points, otherwise corrosion will take place at the defective places and eventually destroy the value of the coating. For specifications regarding coatings for pipe, see the section under "Coatings for the Protection of Main Lines." Sometimes when a prospective consumer does not wish his lawn dug up, or where a paved street is to be crossed, the service pipe is driven from the house cellar to the main, a coupling, then nipple

and cap, being used to drive on, and a 4 by 4 oak block about 12 inches long as a cushion for the sledge to hit. A pipe-forcing jack may also be used. In some soils a dirt auger is used with success—if procured the same size as the pipe it will permit the pipe to pass through the hole without serious binding. The auger is screwed on the end of the length of pipe and the boring is done by turning with a wrench. If a piece of pipe is split in the process, it can be removed and a new one substituted. Either of these methods will possibly work in the right kind of soil where there are no obstructions to be encountered and where plenty of fall can be obtained.

The disadvantages of these methods are, you are never sure of results—never certain that the pipe will either come out where you expect it or have the proper fall. It is also impossible to coat pipe which is put in by these methods. Undoubtedly the best and safest way is to dig the ditch.—('05; Q. B., No. 572.)

Refilling Service Trenches.—A piece of canvas may be put on a lawn along the trench and if the sod is well taken care of and the dirt from the trench thrown out on the canvas there is no reason that the man cannot fill in the trench and replace the sod in such a way that no offense will be found. If a hole has been cut in the cellar wall, it should be carefully filled up and restored to its original condition. Gas companies will find that it pays to do this work in first-class shape and leave the street and consumers' premises in as good condition as found. Care should be taken in refilling around service pipes that only clean, clayey earth or sand is used. Ashes should be especially avoided as such are apt to corrode the pipe.

Protecting Services from Frost.—Service pipes seem particularly subject to trouble from frost. When it is suspected that such trouble will occur, the pipe connection may be laid in the center of a wooden box or tube large enough to form an open air space around it with the ends cemented or closed; this covering to extend from the inside of the cellar wall outward, and in no case should the service be allowed to come in contact with stone or brick.—(Elbert; *Progressive Age*, July 15, '05.)

Where a service pipe passes through an open areaway in entering a building, it is doubly exposed to deposits and freezing, and straw wrappings or boxing are often resorted to. Another method of minimizing the trouble is by making the line through this dangerous section of extra size, connected to the service proper and to the riser by reduced couplings eccentrically tapped and attached at the upper side of the circle, to permit the lower portion of the enlarged pipe to fill up while still leaving a gas way at the top. The editor prefers to employ an inner tube in the enlarged section, open at each end and centered in the larger pipe by a "spider" or similar support, while the outer pipe extends well within the area and foundation wall at either end, for complete protection. This permits the anulus between the pipes to fill up completely with frost or ice, and such a deposit is an excellent insulation from the further effect from cold. One manager who has employed this method writes that a service which had previously required the daily application of alcohol, went through a severe winter after installing this device without attention. Another method to prevent frozen pipes is given as follows: "We have put into use the lime bucket to dry the gas so it will not freeze in cold places like livery stables, freight depots, etc. I do not know how many gas companies use them, or how new they are, but they are a good thing. We use a galvanized half-bushel for the average customer using 4,000 cubic feet to 5,000 cubic feet per month. Tap the bucket on the side close to the bottom and insert a 1-inch pipe which extends across the bucket and is soldered in place. This pipe is perforated on the sides its entire length (inside the bucket) thus distributing the gas equally all over the bottom of the pail. Then put in just enough excelsior to cover the pipe and prevent its stopping up and to better distribute the gas. Then fill about ½ or ⅔ full of good, quick slacking lime (small lumps) and solder in the lid, into which is inserted a 1-inch nipple, to which is screwed the inlet connection of the meter. For larger customers use larger buckets and more lime. We have 1 or 2 in use made from large-sized garbage cans. The cost of the lime box is trifling when compared with the cost of taking care of places that freeze up as fast as you thaw them out, to say nothing of annoyance to customers and loss of business to the gas company."—(W. R. Goudy, *Progressive Age*, April 15, 1905.)

Fittings for Service Work.—In ordering fittings for service work, it is well to order the best malleable iron fittings, and some companies prefer them to be galvanized, as the latter has a tendency to close up any sand holes or porous spots in the fitting. An elbow having one end male and the other end a female thread is designated as a street elbow. The same rule applies to tees. In ordering reducing fittings of this character the size of the female end is always given first. Thus a street elbow ordered 1¼-inch by 1-inch will have a 1¼-inch female end and 1-inch male. "In ordering the ordinary reducing elbows, the larger size is given first, but in ordering reducing tees it becomes necessary to name the run and the outlet. Fig. 1 illustrates diagrammatically the run and outlet and shows the tee reducing on the outlet. Such a tee is read 2 by 1½ inches. The run is read first. In ordering tees that reduce on the run we say 2 by 1½ by 1¼ inches, as shown in Fig. 2. Whenever both ends of the run are of the same size, but having the outlet larger, such a tee is called bull-head and is read 1½ by 2 inches as shown in Fig. 3.

Fig. 1.

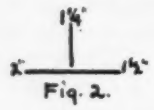


Fig. 2.

Fig. 3

Fig. 4

Fig. 5.

It will be seen that when a tee reduces on the run we will have 3 figures to specify; whereas, if a tee reduces on the outlet, we have but 2 figures to indicate. Thus, in tees reducing on the run, we have 1 by ¼ inch. In like manner, in ordering crosses, we must be particular about stating the size of the outlet or run. A very important rule about crosses is as follows: The outlets of the cross are always of the same size and indicated by the last figures. By referring to Fig. 4 it will be seen that the outlets are 2 inches, while the run is 3 inches; but since the outlets of a cross are always of the same size, it follows that a reducing cross must reduce on the run. A cross 1½-inch by 1¼-inch by 1-inch shows the outlets are 1-inch, while the run is 1½-inch by 1¼-inch. It should be remembered that crosses are read on the run first, and when reducing on the run we have 3 figures to mention; when reducing on the outlets, we have 2 figures to indicate. (Q. B.—E. C. Jones, *Prog. Age*, Oct. 16, '05.)

Connecting Meters.—At the present day it is the custom of almost all gas companies to test their meters when they come from the factory or to test any meter which comes into the shop before being reset. Meters should not only be tested for accuracy, but they should also be tested for capacity and smoothness of working. After being tested the inlet and the outlet of the meters should be closed, either by a cork or a metal cap made for that purpose, which is screwed over the threads. This will prevent the air from entering the meter and drying out the diaphragms. They should also be set upright on a shelf, face outward, so as to be readily accessible. Some gas companies give each meter a shop number or a company number when the test is made, this number being stenciled in brass and soldered on the meter. In connection with the maker's number it provides a ready means for identification.

Orders for Meter Setting.—While a few gas companies use iron meters, the large proportion of meters used are of the ordinary type of tin meter, consequently we will deal with the handling and setting of that kind of meter. All orders for the setting of meters should be given from the office of the company to the foreman having charge of that department. The order should state, if possible, the size and style of meter to be set, the location, and whether it is a resetting or an entirely new job. In the larger cities these orders are taken by a foreman and the orders for a certain district bunched together to facilitate the working. In this case it is customary to use a wagon on which a number of meters can be loaded at once; this wagon also carries an equipment of tools, some pipe and fittings. In the smaller towns the order is probably given to the individual fitter, who takes the meter out with him, measures up the job and returns to the shop to cut out his pipe and make up his connections.

Handling Gas Meters.—At all times meters should be carefully handled. They should he kept right side up. If carried in a wagon, each meter should be placed in a padded compartment for that purpose and the wagon should have easy springs to prevent jolting. Meters should not be thrown, bumped across each other, jarred or mistreated in any way. It is a fact that improper registration is largely caused by the careless handling of the meter, the valves being jarred from their seats and failing to seat themselves properly. Careless handling, too, may break the glass in front of the meter dial. It may dent the meter, causing it to appear unsightly and giving it a scrap-heap appearance. In case the paint is rubbed off or marred, a place is made which is readily rusted through, thereby shortening greatly the life of the meter. —(O. Q. B., No. 473; 1906.)

Lead vs. Iron Connections.—There has been much discussion as to whether it were more advisable to connect tin meters by the use of either lead or iron meter connections. The advocates of lead connections make the point that a lead connection is more easily made, as the lead pipe can be bent into position and that there is less strain on the meter, because if there should be any pulling of the pipe the lead will give a little. They also say that a meter should never be supported by the connections, and for this reason the use of a shelf, which is necessary in case lead connections are made, is no objection to their use.

Lead Connections.—Where meters are connected in this manner, it is customary to keep a stock of lead pieces already made up. These pieces are of two styles; in the one style the meter swivel is inserted directly into the end of the lead pipe thus making a straight connection. In the other style the swivel is inserted in the side of the pipe making a right angle, or what is termed a "shoe connection."

It is better to insert the swivel in the end of the lead pipe making what may be called a straight connection, rather than to insert it in an opening cut in the side of the pipe making a "shoe connection," as it is sometimes called, for the reason that the straight connection is much stronger than the "shoe connection." This follows from their respective methods of construction. The swivel, when inserted in the end, is fastened to the pipe and held by it along a much greater length than when it is inserted through the side; consequently, it is held more firmly and is able to stand a greater strain without breaking the joint and causing a leak.

The swivel being simply a continuation of the pipe, the straight connection affords a freer passage for the gas. Unless the "shoe connection" is very carefully made the swivel is apt to be pushed so far into the pipe that it seriously obstructs the passage of the gas, even when it is not intentionally pushed far in to secure greater strength. If the hole in the pipe is not cut to the proper size and shape there is also danger of solder running down into the pipe and partially blocking it. The tight fit between the pipe and the swivel in the straight connection prevents any such running down of solder into the pipe. Any obstruction, whether caused by the swivel or by solder, has a tendency to give rise to a deposit of naphthaline in the connection. Even if perfectly made the shoe connection causes the gas to change the direction of its travel very abruptly, and thus throws more pressure than the straight connection, in which the change in direction is never more sudden than that caused by the use of an ell. Aside from these excellent reasons the straight connection costs less to make.—(Mastin Simpson.)

One claim made for the "shoe connection" is that it is very convenient when meters have to be set close to the ceiling, but even in such cases it is possible to make the connection in other ways that are stronger and more workmanlike —(A. G. L. A., 1901.)

Iron and Lead Connections.—"Meters are sometimes set with 1 iron and 1 lead connection. The iron connection being used on the inlet gives greater stability for turning the cock and helps support the meter. The lead connection on the outlet gives flexibility and, by allowing for the variation in the width of meters, makes it easier for the fitter to make the connection."—(Mastin Simpson.)

Iron Pipe Connections.—Iron pipe connections for meters are becoming more and more used. The great objection to them has always been they were very rigid and any jar or shock or any strain on the pipe was apt to cause a leak at the meter connection. This has been recognized and has largely been provided for by making the meters stronger where the screw is attached to the case of the meter. Almost any manufacturer now will sell meters with long screws which are riveted to the case, at a very little, if any, greater cost than the ordinary type of meter. The use of these long screws makes it practically impossible to pull the screws away from the meter case without tearing the meter apart. In setting a meter, too, this strain is compensated for by the use of a double swing on at least one connection of the meter and a single swing on the other side. These swings may be formed by using an elbow and 2 street ells, or by the use of a special fitting made for that purpose.

If correct measurements are made for the connections and the swing is used and the inlet and outlet pipes are properly fastened (for this, string or rope should not be used, but wire hooks made for the purpose are best), so that there is no strain on the meter, except its own weight hanging on the connections, there is practically no danger in using iron pipe connections. Among the advantages of this style of connections are the following: That they cost less than lead connections; that they require no shelf; that if properly set up the meter will stay plumb; that the connections are not so liable to be stolen; that an incompetent fitter cannot kink the pipe, which is so often the case in making a lead connection, thus obstructing the flow; and that, in case a meter is taken out, it is easier to reset another meter.—O. Q. B., No. 121; 1904.)

As a comment on the above advantages, it might be said that an incompetent fitter should never be employed on meter work. An incompetent, careless man, by making a leaky or faulty connection, can make more trouble and cause more damage than his wages for a year will amount to.

Location of Meter.—It is assumed that when the service foreman runs the service into the building he takes into consideration the probable location of the meter, as it is desirable that a meter be located as near as possible to where the service enters the building. Greater attention than is usually the case should be paid to the location of the meter. It should be placed where it is readily accessible, not in a locked room or closet, as in this case the meter reader would spend a great deal of time looking for the key. It should not be placed in the coal bin, as it might be struck by some of the coal and become damaged, and the coal might be piled in front of it to such extent that it is almost impossible for the meter reader to see it. It should be so placed that the meter reader can read it readily. It must be remembered that the meter reader will visit the meter frequently, and if it is in a position difficult to read he is liable to make mistakes. The meter should be set in a place having as near an even temperature as possible. If exposed to extreme cold a greater amount of condensation will occur in the meter, the valves are liable to become gummed and stick, causing improper registration, and if subject to freezing weather the leather diaphragm will stiffen up and have a tendency to crack. On the other hand, if in too warm a place, the heat will dry the oil from the diaphragms causing them to become stiff.—(O. Q. B., No, 115; 1904)

Meters should be put as near the ceiling as possible. They are more out of the way there and there is no probability then of them being turned upside down to unseat the valves. In ordinary cases it is advisable to place all of the meters for one building in one place, running separate risers from this one place to different parts of the building. Where meters are set in this manner they are usually set in a row, the supply pipe coming up at one end or possibly in the middle, running over the tops of the meters and making a header from which the separate supply for each meter is taken. It is advisable in making the header to space the meters in such a way that a larger size can be substituted if desired. In placing meters in a block, it is sometimes desirable that all of the meters for each floor should be placed on that floor. In this case a main riser is run up, a branch taken off at each floor and the meters placed in a meter room or closet on that floor.

Testing for Leaks.—It is important that the meter setter be given instruction that the pipe in the building should be carefully tested before setting a meter or before resetting, and that under no circumstances will a meter be connected and the gas turned on until the pipe in the building is made perfectly tight. After the meter has been connected and the gas turned on, the meter setter should proceed to see that the supply is all right by lighting the various fixtures and seeing that they burn properly. He should stay long enough to see that all of the air is blown out of the meter and piping, otherwise complaint may come to the office that there is no supply; after which he should, with soap and water, test the meter connections for leaks. Under no circumstances should a light be used for testing for leaks around the meter, for if the leak were a large one an explosion might occur, and if the leak were a small one and near the meter connection, it might light and burn without being noticed by the fitter, but would eventually melt the solder, causing the connection to part from the meter resulting in considerable damage.

Prepayment Meters.—In general prepayment meters are so located as to be accessible only to the consumer for whom the meter has been set. This makes the consumer feel a responsibility for the meter and there is less likelihood of its being tampered with, and in case it is tampered with, it is easier to fix the responsibility. It is also advisable to set these meters in a position where it is comparatively easy for the consumers to get to them and insert the coin. They should not be set where they are accessible from the street, as this would make it easy for someone to break open the box and extract the money. It is doubtful whether it is advisable to set meters of this kind for hotels or rooming houses as there is the danger of the meter shutting off, causing the extinguishment of the light or fire, and afterwards one of the boarders or roomers drops a coin in the meter, causing it to start running again, and the escaping gas from the outlet which has been extinguished, asphyxiates the occupants of the building.

Meter Cock Seals.—Meter cock seals are now placed on the market. These are used by some gas companies. Instead of taking the meter out when a consumer discontinues using the gas or moves from the

premises the stopcock of the meter is sealed in such a way that no gas can be used by an incoming tenant until the gas company has been notified and a man has been sent from the office to break the seal. This, of course, is much less labor than taking the meter out and setting it again.

Leakage of Gas.—Leakage of gas is a problem confronted by all gas companies and one which every gas company is anxious to remedy as far as possible, as the loss of the gas entails a loss of money. In addition to this, there is damage to trees and vegetation, the danger of explosion, the unpleasant smell causing discomfort and annoyance to the residents of the city, and it has been claimed that gas leakage will soften asphalt pavement, but the claim does not seem well founded. Simpson, '03; Q. B., No. 102, says: "I have found considerable softening of asphalt over ditches, but I could never trace it to the gas itself, although there were frequently leaks under such abrasion, but I have found exactly the same conditions over sewer trench and water mains, and my belief is that the softening is due entirely to the working of the ground under heavy traffic over the ditches. For 6 months of time we hung in a jet of impinging gas a piece of asphalt and, as far as strength of texture was concerned, we could find no difference after the test."

Baehr, '03; Q. B., No. 102, says: "When there were gas leaks in the mains caused mostly by the proximity to steam heating pipes, the concrete under the asphalt became saturated with gas getting to be of a bluish color. The asphalt itself disintegrated slowly under the same influence and became soft and smelt strongly of gas. The evidence was unmistakable." In this instance the writer's opinion, however, is that the softening of the asphalt was due to the steam heating pipes and not to the effect of the gas.

"If due care were taken and conditions were perfect, there would undoubtedly be no leakage from mains and services, as it is possible to lay both cast and wrought iron pipe and have the system bottle tight."—(Walton Forstall and Shattuck, '04; Q. B., No. 103.)

To be Continued.)

[Communicated by "R."]

Havana: A City of Lights.

This is the land in which everybody burns numerous lights. Lights are in operation in lower floors, middle floors and upper floors of practically all dwellings. There are lights in the cupalos and lights on the porches; lights are burned all night at the gates. In fact, one might well call the city of Havana and suburbs a city of lights. I wondered how the people could afford to burn the gas and electrical lights so freely, until I found out that several descriptions of lights are used to help keep down expenses. Carbide is procured here in 100-pound casks for $4.50, American money, at retail. You would be surprised on seeing the number of acetylene gas plants in operation in the Havana homes. It seemed to me that every dwelling, as well as nearly all buildings for business purposes, is furnished with exterior structures in which carbide gas is generated for the supplying of light; and some of these exterior structures are really attractive little buildings. The attached illustrations were sketched from some of the carbide houses. The people of Cuba take to the acetylene light with great freedom. Your correspondent who has travelled in the Philippines, China, Japan, Hawaii and other countries, observed that carbide generators were used in some degree for the making of lights for homes and business houses; but the proportion of carbide consumed in Cuba is many times greater. It seems to be the fad to have an acetylene gas light plant in connection with the other light equipments of the building.

Some homes and business houses use four styles of light, namely, gas light, electrical light, carbide gas lights and oil lights. It is very usual to find the acetylene light in service with the electrical jets. Often the common house gas lights and carbide gas lights are combined in furnishing brilliancy for the Spanish or Cuban home. The foreigner who comes to the Islands quickly adopts the same method and has his installation of carbide gas made for permanent use. The United States Army is here now, and where the troops are located at Camp Columbia, 9 miles out of Havana, a number of carbide gas generators are being introduced for lighting purposes. I find there are several reasons for the use of the carbide gas in this country. The leading one, of course, is the great desire of the people for plenty of light, who like to have a light shining in every room, whether the room is used or not. The people delight in entertainment and music on the porches of an evening, and numerous lights are required to make the scene right. If the people were to use electrical lights, or even the house gas at prevailing rates, for purposes of lighting as a Cuban mansion ought to be lighted, the cost would be high. Therefore, the cheaper lights are sought out. At present the carbide gas is in favor, and numerous exterior structures are in course of building for the installation of gas making plants at the back of residences and business houses. If the people of the United States were to burn lights with the same liberality that the people of Havana do, the gas companies of America would reap a harvest.

The Cuban may economize on food and clothes, but he will pay out money liberally for lights and flowers. He does not overlook music, either. Lights, flowers and music are his choices. It is really worth the while to take a car ride through the city of Havana and the suburbs of Vendado and Marianoa for the purpose of observing the lighted porches and houses. The first light is at the gate of entrance; the next series is at the porch, followed by one over the main door. Then come the house lights, and you get a picture which reminds you of a theatrical representation. Neatly dressed ladies and children are on the porches or in the rooms. There is music. Perhaps wines are served. The gentlemen are neatly dressed. There are no blinds or curtains, and you can see everything and everybody. It is a beautiful sight. You can count two or three, sometimes four, kinds of lights, and distinguish them by their brilliancy. This keeps up late. The Americans do some figuring on gas bills. The hours of the night are counted at so much per hour for gas expended; but the people of this country appear to overlook gas bills. They let the bills run on. They are inclined to sleep an hour or two in the afternoon, consequently they are

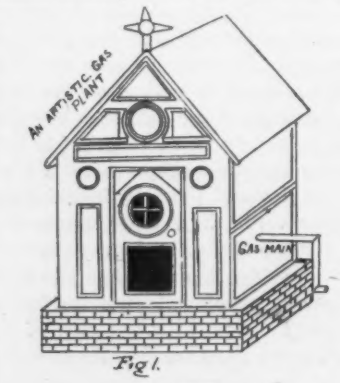


Fig 1.

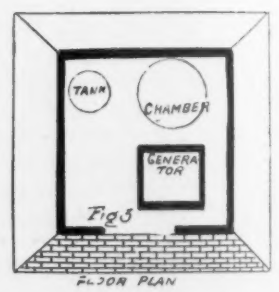


Fig 3
FLOOR PLAN

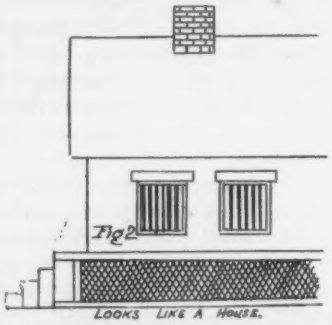


Fig 2
LOOKS LIKE A HOUSE.

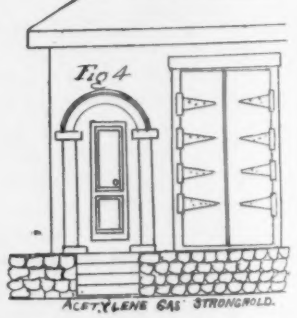


Fig 4
ACETYLENE GAS STRONGHOLD.

rested for a night's entertainment. Therefore, to ride through the streets of the city and the suburbs at midnight means that you will find the lights brilliantly glowing in the homes. Soon after midnight things quiet down. The lights are extinguished and the shutters are closed, the iron gratings are clasped and the exterior of the house is gloomy indeed.

Meanwhile the meters have been clicking merrily along, and really quite a little item of gas and electrical light bill has been run up during the long evening. But nobody cares. The cost is kept down to some extent by the use of the acetylene lights. And the Spanish and the Cuban folks are not satisfied with crude underground arrangements for the making of the gas. They do not use a basement, because as a rule no basements are made in these homes. They erect separate little edifices for the gas outfit. Everything connected with the generation of the gas is kept in this building. I have seen these structures erected with great care in conspicuous places in the grounds. The little things are well designed and finished. Fig. 1 will give an idea of one of the fanciful types of buildings used. The structure is made just about large enough so that a person can readily stand and move about inside, after the equipment for generating the gas is installed. The exterior is finished off to harmonize with the plan and color of the main buildings. The gas house is a part of the estate, just as in America we often see a dog house built to harmonize in shape and color with the residence or the barn. Sometimes the gas house is built like a living house, as in Fig. 2, and is divided off into rooms so that the servants

may live there and look out for the plant. There are not many of the combination structures, however, because as a rule it is considered safer to have the plant in a building of its own. Fig. 3 is a diagram showing the floor plan of one of the typical gas houses.

Fig. 4 is a sketching of one of the large sized buildings, used for maintaining a big outfit for furnishing a public building with gas. All of these buildings are erected with a view of being exceedingly strong. Bolts and screws are employed freely. Some of the little structures are entirely of stone; others are brick and wood; some are covered with sheet metal.

The people quickly become familiar with the use of the carbide, and I have not heard of any accidents, although thousands of the equipments are in nightly service.

A Handsome Business Headquarters.

The illustration gives a pretty good idea of the handsome, commodious and convenient office building and business headquarters for the Coldwater (Mich.) Gas Light and Fuel Company. The structure was completed last fall and the Company has been comfortably ensconced therein for well over a month. The building is a notable

addition to the business showplaces of Coldwater, and goes to prove that Coldwater's gas suppliers are quite up to the times. For the drawing and other courtesies in connection with this matter we are indebted to the attention of the Company's Secretary, Mr. George C. Turner.

Historical Notes.

[Presented to the last meeting of the Pacific Coast Gas Association, by MR. GEORGE P. LOW, the Association's Historian.]

The resolution which instituted an Historian for the Pacific Coast Gas Association presumes the creation of an elective office, to be filled from year to year, the duties of the holder of which to consist in recording events of general interest to the Association as they transpire, for in so doing there will be compiled and preserved an historical resume of enduring value. To collect such information, however, necessitates unreserved co-operation on the part of every member of the Association toward the Historian—a co-operation which has thus far failed to be in evidence.

The year 1906 will ever be memorable in the history of the Golden State. Let us, then, complete the story of the past up to it, so far as it is possible to do in the present contribution, by rounding out the information already in hand and by bringing the history of the industry up to the momentous present year, in order to make the pathway clear for the coming Historian in his task of gathering for record coming events.

In presenting that which follows, therefore, your Historian asks for indulgence toward any repetition which may appear. In particular does he bear in mind the thoroughness of the paper read by Mr. T. R. Parker before the meeting of 1904; but he believes that his duties would not be aright were he to fail to impart any information of which he may have become possessed in addition thereto.

Fresno.—Since their establishment in 1883 the Fresno gas works have occupied the intersection of Tulare and F streets; but, from a single coal gas bench and a 7,000-foot holder, with 1 mile of street main and 50 consumers' meters, it has gone through many interesting states of development.

The Fresno Gas Company was incorporated in 1883, and two years later the works had been increased to 2 benches of 5's, with an output of about 25,000 cubic feet of gas per day in winter and, perhaps, 15,000 cubic feet in summer. Thenceforth it showed a yearly increase of approximately 12 per cent., the total output in 1889 averaging 24,400 cubic feet per day. Mr. N. O Smith, its Superintendent, was succeeded some months later by Mr. Danville Decker, who assumed charge of both the gas and the electric systems of the Company. In 1891 Mr. Decker installed two Lowe water gas sets, that had been bought second-hand from the Oakland Gas Light and Heat Company. One of these sets had a capacity of 125,000 cubic feet, making 21-candle power gas. Upon the completion of the water gas sets the manufacture of coal gas was discontinued.

The present plant consists of a Lowe crude oil set (erected October, 1904) 9 feet in diameter, with a capacity of 200,000 cubic feet per day of 20 hours, and a Jones oil gas set, having an output of 800,000 cubic feet per day of 20 hours, the product being a 24-candle gas of excellent quality.

Originally the price of gas in Fresno was $5 per 1,000, but in the winter of 1891–92 it was reduced to $4, then later, in 1892, it was reduced successively to $3.50 and to $2.50, but on January 1, 1893, the price was raised to $3.50 for illuminating gas.

At the outset, Wallend-Sydney and Greta coals, costing $13.50 per ton with $4.90 added for freight, were used in coal gas making, and Australian shale, costing in the neighborhood of $30 per ton delivered, was used for enriching. Service was initiated, as stated, with 50 meters; in the spring of 1886 about 450 meters were installed; 10 years later the number of meters had been increased to over 700, while at present the list has reached a total of 1,400 meters.

No competing gas company ever entered Fresno, but in 1890, when Mr. Robert C. Barton, of the Barton Vineyard Company, was building the Barton Opera House, Mr. A. E. Brooke Ridley, then of the Edison General Electric Company, induced him to install an electric plant for lighting the Opera House. This suggestion was duly carried out, and two 20-kw. Edison, bipolar dynamos, steam driven, were installed; but, after Mr. Barton's death in 1891, it was determined to enlarge the plant so as to engage in commercial lighting in opposition to the Fresno Gas and Electric Light Company, by which name the Fresno Gas Company had become known through re-incorporation. Thereupon the Edison Electric Light and Power Company, of Fresno, was organized and incorporated by several prominent citizens, among whom were Messrs. John M. Ryan, President of the Company; Louis Einstein, Frank H. Sharp, Louis Gundelfinger, William Fahey and W. McCallum. Mr. Axel Gutsch was appointed Manager of the new Company.

Competition between the electric lighting plants of the Edison and Gas Companies was very keen for 2 years or so, when, in the fall of 1892, the Edison Electric Light and Power Company was absorbed by the Fresno Gas and Electric Light Company.

It was during this time that freight on Santa Paula oil was $132 per carload from the Santa Paula fields to Fresno, while the freight on the same car of oil to San Francisco was but $62. The cost of coal was all but prohibitive, as it ran as high as $12 per long ton of Cardiff, and $4.90 to be added for freight from San Francisco to Fresno; in fact, the records of the Company show that, during the 4 years from 1889 to 1893, inclusive, the Fresno Gas and Electric Light Company paid the Southern Pacific Company, for freight on coal, the very sizeable sum of $37,612.76. These figures show why the advent of electrically transmitted power made the successful operation of a steam driven plant an impossibility in Fresno, and they also show why the price of $18 per month imposed for the 24 street arc lamps operated from the steam plant, was not extortionate regardless of the prices prevailing in other localities.

It is also interesting to note the condition of the gas business at that time. During this period of 4 years, from 1889 to 1892, inclusive, the output and gross income, respectively, of the Fresno Gas and Electric Light Company were as follows:

Year.	Output, Cubic Feet.	Gross Income.
1889.....	8,870,000	$34,079.40
1890.....	9,715,000	37,503.60
1891.....	10,358,000	39,783.75
1892.....	10,306,000	26,928.70

After the absorption of the Edison plant, the Fresno Gas and Elec-

tric Light Company held undisputed sway until April, 1899, when the world famed transmission line of the San Joaquin Electric Company began transmitting power into Fresno from the South Fork of the San Joaquin river, some 35 miles distant. This was then the longest distance transmission line in the world. Beyond this it was a very notable engineering achievement in many respects; but, despite the *finesse* of its engineering triumphs, its management failed to take due note of the many items constituting the fixed charges of expense in the conduct of a transmission plant, with the result that ruinously low rates were established—in some cases as low as 10 cents per 16-candle power lamp per month—in the endeavor to drive the Gas Company out of the electric lighting business. Its campaign was one of destructive competition, waged with the ardor of inexperience. By virtue of its far lower bids, the San Joaquin Electric Company took the contract for city lighting at the rate of $6.40 per lamp for 80 2,000-candle power street arc lamps, as well as practically all the commercial and residence lighting of the city, so that after a 5 months' war the Gas Company relinquished the electric lighting field to the transmission company, and a year later, during the period when Mr. Gutsch was again Secretary and Manager of the Gas Company, the San Joaquin Electric Company was forced to go into the hands of a receiver. This retirement, on the part of the Gas Company from the electric lighting and power fields in Fresno, marked the close of what was probably the most bitter fight that ever occurred in California between a steam driven electric plant and a power transmission plant. The advantages were primarily favorable to the transmission interests, particularly because of the high price of fuel in Fresno and the comparative cheapness of transmitted power under a proper administration of the financial end of the business; but the gross mismanagement of the transmission plant, coupled with the exceeding popularity of gas as a fuel in Fresno, made the apparently ultimate success of the transmission company not an unqualified one, for the Gas Company did not retire from the electrical business in Fresno without its full meed of compensation.

Marysville.—The original gas works of Marysville were located on the northwest corner of 2d and B streets, in a brick building that is now the Marysville office of the Bay Counties Power Company. In the rear still stands in active service the original holder which came around the Horn and was erected in 1860. It is of riveted sheet iron, floating in an underground wooden tank, and is now out of use. In 1861 the length of main had increased to 14,500 feet. As to the price of coal, originally Wigan cannel cost $24 per ton; a coal brought from Chili cost $15 per ton, and Lesmahago cost $22 per ton. At the outset gas sold for $12 per 1,000, but in 1861 it was reduced to $11, and in 1863 another reduction of $1 was made.

The gas works of this original plant consisted of 2 benches of 4's, with cast iron retorts—some of which, by-the-way, may to-day be seen on the streets of Marysville, where, half buried at street corners, they serve to protect the curbing from the wheels of passing vehicles. The original holder already referred to measured 40 feet in diameter by 16 feet in height, and had a capacity of approximately 20,000 cubic feet. In 1879 the business of the Company had increased to an annual output of 12,300 cubic feet, which necessitated extensions that warranted an increase of the capital stock of the Company from $50,000 to $100,000, which was done in the year named. Mr. D. E. Knight was then elected President, and from then on until his death he was paramount in the administration of the Company's affairs.

Competition from an electric lighting source sprang up in 1886, but no competition arose in the gas business until 1898, when the Yuba Power Company (which afterward resulted in the organization of the Marysville Gas and Electric Company) gave a contract for the installation of a water gas plant to the Western Gas Construction Company, of Fort Wayne, Ind. The latter at once built one of its well-known single sets, having a capacity of 3,000 cubic feet per hour. This plant was finished on the first day of October, 1898, and the 2 Companies occupied the field until March 1, 1899, when the Marysville Gas and Electric Company bought the entire plant, property and goodwill of the Marysville Coal Gas Company. Since then, the Marysville Gas and Electric Company has been the sole distributer of gas and electricity for all classes of service.

The Western Gas Construction Company's plant was superseded September 1, 1901, by a Lowe, crude oil set, which has a capacity of 90,000 cubic feet per 20-hour day. The works adjoin the sub-station of the Bay Counties Power Company, which are located near the levee on the north side of the street. Here an underground, 285-barrel oil tank is installed, and a 20,000-foot storage holder, resting in a wooden tank on the surface of the ground, was erected in 1898. In addition, a 20,000 cubic foot relief holder has recently been installed, as has also a 175,000 cubic foot Jones oil gas machine.

After the consolidation of the original companies, Marysville showed an extraordinary increase in the consumption of gas for fuel purposes. In 1896 there were but 6 appliances in Marysville for the use of gas as fuel; in 1899 there were 140 such appliances, and in the spring of 1902 there were over 300 gas stoves alone in use, while 70 per cent. of the output of the works is in fuel gas. A more striking instance in illustration of the possibilities of development in the consumption of fuel gas cannot be cited in all the country. True, Marysville possesses almost every climatic advantage in favor of the use of fuel gas, but the success attained has been due to favorable rates and hard missionary work in the way of education and solicitation, rather than to climatic advantages. Aside from the usual household uses, gas is consumed in practically all the laundry, candy cooking, soldering, can making and cannery industries thereabouts; and it has done this to the displacement, after competitive test, of every other available heating medium from which fuel can be made. The largest individual consumers are the canneries, which, during the season, consume an average of 20,000 cubic feet of gas per day. The increase of gas sales since the organization of the Marysville Gas and Electric Company will probably average 10,000 cubic feet per month, and now the total output during the summer and fall months has reached the imposing total, considering the size of the town, of above 1,000,000 cubic feet per month. In 1899 the largest daily output was 23,000 cubic feet, or say 8,000,000 cubic feet per year, showing an apparent increase of but 2,000,000 cubic feet annually; but when it is remembered that the bulk of the lighting service is rendered in Marysville by electricity, the growth in the consumption of gas is remarkable.

[To be Continued.]

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

In our item columns for the 3d inst. (p. 986) we noted that the Coldwater (Mich.) Gas Light and Fuel Company had instituted a novel prize scheme, the main thought of which was a count, by the pupils of the Coldwater public schools, of the actual number of consumers of gas in a certain business block of the city. The competition was duly held and the result thereof is given as per a local publication recently to hand: "The boys and girls have been busy the past few days canvassing the district covered by the Gas Company's prize offer. Although many correct answers were received, John Oesterle, North Polk street, was the first to hand in his answer, at 12:45 P.M., November 22d, and receive the $5 prize. His estimate was '67 gas consumers.' Of the business places not using gas, two are not open after dark, so that less than .7 of 1 per cent. of the business places that could use gas do not do so, showing how indispensable gas has become in an up-to-date city. The first answer received was from Maptia Trubey, 139 Morse street, who wrote, 'I think they all do. If they do not, they ought to.' In view of the fact that this little girl is starting in life with the right idea of the value of gas, and is not afraid to express it, she will receive $1 if she will call at the gas office for it."

Last month the *Electrical World*, in an article entitled "Gasoline Lighting Permits Valueless," had this to say on the subject: "Mr. V. L. Scott, of the commercial division of the San Antonio (Tex.) Gas and Electric Company, has prepared a legal digest on gasoline lighting permits, which has been briefly outlined in the American Gas Institute proceedings of 1906. Mr. Scott's conclusions from the various decisions rendered seem to show that while gasoline lighting permits are issued regularly on insurance policies, such permits are so worded, and so restrict the owner of the property, that for all practical purposes they cancel the insurance policies both of the occupants and owners of the building. Court decisions are cited to show:

"First.—That any of the numerous restrictions contained in gasoline lighting permits, when violated by the insured, void the policy.

"Second.—That the violation of any of these restrictions by the occupant of a building not only voids his policies on stock, but also voids the policies of the owner of the building regardless of the fact that the owner's policies have attached thereto gasoline lighting permits.

"Third.—That on a strict interpretation of the law it is almost impossible to handle this deadly explosive in such a manner as not to violate restrictions contained in any gasoline lighting permit."

Mr. Scott has had the "digest" copyrighted, but will send a copy to any electric light company, the applicant to send a stamped, addressed envelope for a reply.

Mr. W. H. Riblet, of the Pintsch Compressing Company, has prepared plans and estimates for the enlarging and better equipment of the Company's plant at Ogden, Utah. The plant is to be enlarged to a point equal to the output of 240,000 cubic feet each 24 hours.

The Rev. Father T. Hogan, rector of the church of the Sacred Heart, Trenton, N. J., from the pulpit of his church some Sundays ago, rather

severely scored the Public Service Corporation, charging that the gas supplied was of very inferior quality and that the bills therefor were exorbitant. While we think the Corporation is giving at least fair service to Father Hogan and his parishioners, we certainly are sure that his arraignment of the Corporation is altogether intemperate, if the words therein are to be taken at their book meaning.

THE regular dividend on the shares of the Equitable Illuminating Gas Light Company, of Philadelphia, Pa., is payable the 15th inst.

THE proposed auction sale of 2,000 shares of the Trenton (N. J.) Water Company, which shares were among the properties that came into the hands of Mr. George W. Pepper, as Receiver of the Bay State Gas Company, of Delaware, was held at the time and place named. The shares were duly offered, but as no bid was made the sale was declared off.

THE Massachusetts Board of Gas and Electric Light Commissioners has approved an issue of 116 shares additional stock for the Attleboro Gas Light Company. The price at which the shares may be offered was fixed at $225.

THE new storage holder, erected for the Norwalk (Conn.) branch of the Connecticut Railway and Lighting Company, by Messrs. Deily & Fowler, of Philadelphia, has been formally accepted. It is rated to store 200,000 cubic feet.

THE Hemet-San Jacinto Gas Company, of Hemet, Cal., has purchased a plot, north of the Atchison, Topeka and Santa Fe Railroad, and perhaps 500 yards outside the town limit, whereon to construct its works.

THE Consolidated Gas Company, of Pittsburgh, Pa., has decided to abolish all meter rents and "minimum charges." No charge is made for putting in services or meters.

THE Leadville (Col.) Gas and Electric Company has been acquired by the Leadville Light and Power Company, recently incorporated by capitalists of Colorado Springs, Col. The officers are: President, W. W. Davis; Vice-President, Henry Hine; Treasurer, L. E. Curtis; Secretary, G. B. Tripp. Messrs. Curtis and Hine are actively connected with the management of the Central Colorado Power Company.

THE gas plant proposed for Suffolk, Va., will undoubtedly be constructed the coming spring.

THE expenditures so far made on betterment account for the Kingston (Can.) municipal gas plant amount to $80,000. An early reduction in the selling rate is promised.

THE Seattle (Wash.) Lighting Company is arranging for important extensions to its main system.

WE are indebted to Mr. F. J. Weeks for the following, forwarded under date of the 8th inst: "Judge Brooke, of the Circuit Court, this week handed down a decision that will interest gas consumers in Detroit. The opinion was rendered over the complaint of Henry J. Boerth, a restaurant keeper, who protested against paying the Company 80 cents per 1,000 cubic feet on illuminating account, whereas those who used gas for power account were obtaining their supply at 60 cents per 1,000. Boerth insisted that the varying scale was unreasonable, and in the argument pointed out that the ordinance of 1893, fixing the rate at 80 cents, was all against discrimination. Judge Brooke, in deciding for the Company's contention, asserted: 'Not all discrimination is unlawful. In fact, in order to make a discrimination unlawful it must be made without any lawful excuse on the part of the public service corporation making it, and it must, in its operation, work an injury to the complaining party by favoring someone else at his expense.' The Judge also pointed out that Boerth was not suffering because of the lower rate, inasmuch as other restaurauteurs are paying a like charge. The reason that the Company could afford to give a 60-cent rate to users of gas for power is that the latter class of consumers use it in enormous quantities. In dismissing the bill the Judge further distinctly held that the Gas Company could make a lower rate to one class, if it so elected, provided in so doing no injustice was done to the other users."

"THE Woman's Club is up in arms," remarks a recent issue of the Omaha *News*. While there is nothing strange or new conveyed by that intimation *per se*, it is in its specification that the danger lies. The Woman's Club is proposing to pound the Gas Company, at least, the Social Science section of the Club is doing the pounding. In any event the aforesaid section held a meeting the first Monday of the month, and the topic for discussion was the Gas Company and its policy. The question having been properly outlined by the Chairlady, the first one to receive recognition was Mrs. Edward McGilton, who flourishing a fan-like bunch of bills (of the Gas Company type), declared these documents showed that since the gas rate had been lowered from $1.35 to $1.25 per 1,000 cubic feet, she had paid at least 25 per cent. more for her gas supply than formerly. Next came Mrs. Martha Parks, who we are told is Presidentess of the Park Plumbing Company. She, in the course of her remarks, gravely stated that all plumbers, without distinction as to sex, had been notified to "put in large gas pipes, as the new gas is of inferior quality," so she had been told. Other speakers gave voice to their opinions respecting the subject, and then a vote was ordered, the result of which was that two-thirds of those present formally registered themselves as declaring "there had been a marked increase in bills, since the adoption of the lower priced gas rate." And there you have it.

WE understand that the Heat, Light and Power Company, of Muncie, Ind., has determined to construct two very large gasholders for the better distribution of natural gas in and through the Indianapolis district.

IT is reported that Jacob J. Frey, of the Hillsboro (Ills.) Light and Power Company, and David Davis, of the Litchfield (Ills.) Gas and Electric Company, have perfected a syndicate under which the electric supply of the named places, and that of Raymond, Ills., will be operated on joint account.

THERE is little doubt that the projected gas works for Savannah, Mo., will be constructed next spring.

THE new ordinance under which the Cincinnati Gas and Electric Company is to supply electrical current to the residents of Norwood is to run for 25 years, and that the rate charged for current shall not exceed 11 cents per kilowatt. The Company may, however, charge a minimum bill of $1 per month.

THE gas division of the business of the Bristol and Plainville (Conn.) Tramway Company is now being carried on in handsome offices established by the Company on Riverside avenue, Bristol. In fact the Company now has its office business and the housing connected therewith all under one roof. The Company's gas output is increasing at a rate most gratifying to those of the corporation who some months ago insisted that gas was "a pretty good thing." It certainly is.

THE owners of the Port Jervis (N. Y.) Electric Light, Power and Gas Company have succeeded in securing a reduction of the Company's assessed valuation on franchise tax account from $40,000 to $28,000.

MR. WILTON S. SCHUYLER, of St. Joseph, Mo., has perfected a gas stove for intermittent or occasional heating account or use, that seems to have much merit. The gas men will soon have an opportunity to take a practical view of it, an order for 5,000 of the stoves having been placed with the Howard Stove Works, of Savannah, Ga.

IN the case of E. T. Wright vs. the Philadelphia Company, Judge Miller, of the Pennsylvania Supreme Court, has determined that the deposit demanded by the Company, to insure the payment of gas consumed by Wright, was excessive. The opinion, however, is very explicit and positive over the right of the Company to demand a reasonable deposit.

MR. GEORGE PALM, President of the Palm Gas Engine Company, of Pittsburgh, Pa., did at his home in Butler, Pa., the evening of the 5th inst. He was in his 59th year, and was noted throughout the petroleum oil and natural gas industries for his ingenious inventions connected therewith, several of which bear his name. He became a resident of Butler in 1883, and is survived by 3 sons and a daughter.

MR. WALTER E. OTT has been appointed Inspector of Public Lighting for New Albany, Ind., under the ordinance recently passed by Councils creating the named office.

SPEAKING of the need for the carrying of pass keys by the meter readers of gas companies, and the objection to such carrying by the houseowners or occupier, Mr. Chamberlain, of the Grand Rapids Gas Company, Grand Rapids, Mich., admits that charges are sometimes made against readers, but in every instance, after thorough investigation, such charges have been completely refuted. He mentions the following specific instance: "The family were moving and reported the loss of 6 solid silver spoons, which they were sure the meter reader must have taken, as he was the only one in the house besides the family at the time. The man had been quite a while in the employ of the Company, his honesty was known and he insisted that he had not taken the spoons. The Company investigated the matter carefully, with the result that it was learned that the spoons had never been unpacked during moving operations, and had not been stolen. Apologies naturally followed."

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, DECEMBER 17, 1906.

The Market for Gas Securities.

There was neither animation nor change in the market for city gas shares last week, although the undertone was firmer and inquirers were in greater number. The Company's business is becoming simply enormous. Another section of Unit No. 2, of the new works at Astoria, was fired up this week, and the starting was made without confusion in the presence of a very select number.

Brooklyn Union showed some life in the week, but the nominal bid and asked figures remain about as before—from 106 to 120. Peoples Gas Light and Coke, of Chicago, has managed to cross 95, and it will not be long before it crosses par. Consolidated, of Baltimore, is 85 to 90. The U. G. I. Company's quarterly dividend of 2 per cent. is payable the 15th prox. The financial position of this Company was never stronger than it is now. The Cincinnati Gas and Electric Company's dividend of 1½ per cent. is payable the 1st prox., and the Columbus (O.) Railway and Light Company will, on the 15th prox., pay a dividend of 1 per cent.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 17.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	187	189
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	225
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	98½	100
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	106	120
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	100	100½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	2,500,000	50	200	204
Consolidated, Baltimore	11,000,000	100	80	90
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	05
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	58	58½
Preferred	25,000,000	100	84½	85
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	95	95¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	294	295
First mortgage 6's	600,000	..		
Western, Milwaukee	4,000,000	..	..	..
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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 12, 1906.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th, 1907, to stockholders of record at the close of business, Dec. 31, 1906. Checks will be mailed.

1645-4 LEWIS LILLIE, Treasurer.

SEALED PROPOSALS.

OFFICE OF
SUPERINTENDENT OF THE CITY GAS WORKS,
RICHMOND, VA., November 30, 1906.

Sealed proposals will be received at this office, Room 9, First Floor, City Hall, until 5 P.M., February 1, 1907, for furnishing and erecting complete the necessary buildings, machinery, apparatus, pipes, etc., for the rehabilitation and proper enlargement of the City Gas Works, of Richmond, Va.

Each bid must be accompanied by a plan showing the completed work which the bidder proposes to furnish, giving all essential details, dimensions, etc., and complete specifications of same.

Pamphlets containing further information for bidders, and general schedule of the proposed extensions, will be mailed to contractors who apply at the office of the Superintendent of the City Gas Works, where, also, plans of the existing works may be seen.

Separate bids will be required for each specific branch of the improvements, also a lump sum bid for the entire and complete rehabilitation.

Bidders will state approximately the time from date of acceptance of contract to complete each specific branch of the work, and also the work as a whole, all of which shall be executed in a manner that will not cause any temporary suspension in the operation of the works or shortage in the supply of gas on hand necessary to meet the demands of consumers.

Envelopes containing proposals should be marked "Proposal for Rehabilitation City Gas Works," and addressed to the undersigned.

The successful bidder upon the award of the contract will be required to execute a satisfactory contract and bond in a sum to be hereafter determined for the faithful execution of the work.

The Committee on Light reserves the right to reject any or all bids, or any part thereof, and award the contract in part or in whole to any bidder or bidders if in their judgment they deem it to be to the best interest of the city, subject, however, to the approval of the City Council.

W. P. KNOWLES, Supt.

1644-2

Estimates furnished for the erection of complete gas works or the extension and modernizing of old works. All work warranted. Both water gas and coal gas.

EMPIRE GAS IMPROVEMENT
& CONSTRUCTION COMPANY,

1628-tf 49 Wall Street, New York.

Position Wanted.

A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.

Address, "P. T. A.,"

1641-tf Care this Journal.

WANTED.

Experienced and successful manager and engineer wants position. Excellent references.

Address, "F. N. B.,"

1644-3 Care this Journal.

POSITION WANTED.

A competent manager and superintendent, now employed, desires a position as manager of a gas or combined gas and electric light plant, in a town of 10,000 inhabitants or larger.

Address, "R. W.,"

1643-3 Care this Journal.

Situation Wanted

As Superintendent of a Gas Company,

By a man 40 years of age. Twenty years' experience in the management of coal and water gas plants. Can show a record of increasing consumption and economic manufacture and distribution. Can furnish the best of references. Address "B L. V.,"

1644-2 Care this Journal.

Position Wanted.

Technical engineer, who has had nine years' practical experience in all departments of the gas business, and at present holding a responsible position with a large gas company, wishes to devote a part of his time to the management and development of a small gas or gas and electric company in the Central West. Is alive to the possibilities of the present day practice and can produce results.

Address, "XX.,"

1644-2 Care this Journal.

Position Wanted

By a Practical Man as Manager or Superintendent of either Coal or Water Gas Plant.

Has had experience in all branches of the business. Address, "SUPERINTENDENT,"

1644-2 Care this Journal.

WANTED,

By a young man of 7 years' experience in all the branches of the gas business, a position as superintendent or manager of a gas plant, either coal or water gas. Good hustler, who can get results. Excellent references. Would also consider a good commercial position.

Address, . . . "N. Y. C.,"

1645-1 Care this Journal.

WANTED,

EXPERIENCED GAS SOLICITORS,

By a company adjacent to New York city. Good salary and commission paid. Address, giving full particulars as to experience and salary expected,

"S. A. G.,"

1643-tf Care this Journal.

NAPHTHALENE SOLVENT.

Cheap and Efficient.

For Use in Works, Mains and Service Pipes. Shipped in 100-gallon Drums.

Semet-Solvay Co.,
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The Gas Engineer's Laboratory Handbook,

By JOHN HORNBY, F.I.C.

Price, $2.50.

FOR SALE BY

A. M. CALLENDER & CO.,
42 Pine Street, New York City.

POOLE ON FUELS.

THE CALORIFIC POWER OF FUELS.

By HERMAN POOLE, F.C.S.

Second Edition. Price, $3. For Sale by

A. M. CALLENDER & CO., 42 PINE ST., N.Y. CITY

GAS PLANTS FOR SALE.

We have several small Gas Plants for sale.

THE GAS AND ELECTRIC DEVELOPMENT COMPANY,

1328 CHESTNUT STREET, PHILADELPHIA, PA. 82 BEAVER STREET, NEW YORK CITY.

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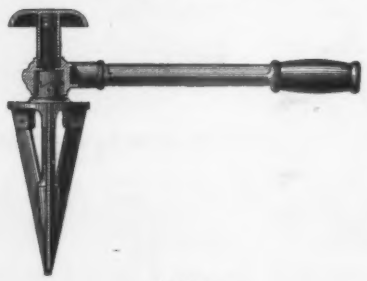

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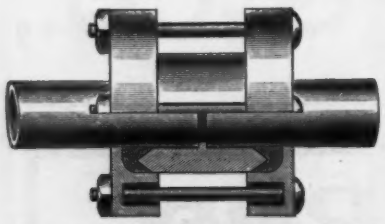
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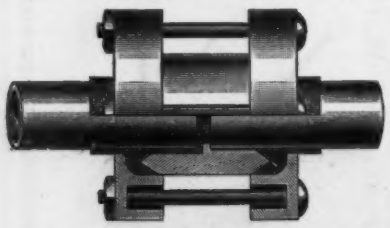
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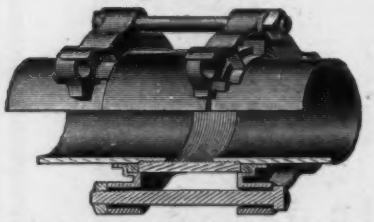
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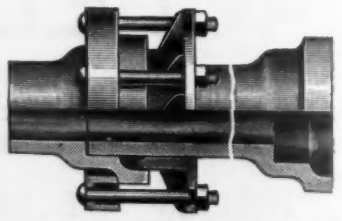
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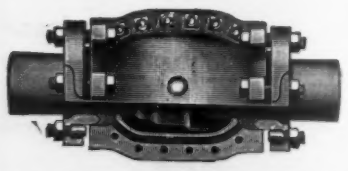
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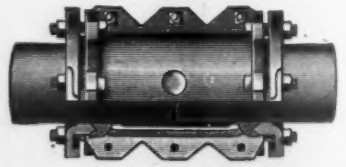
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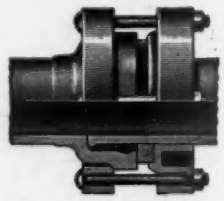
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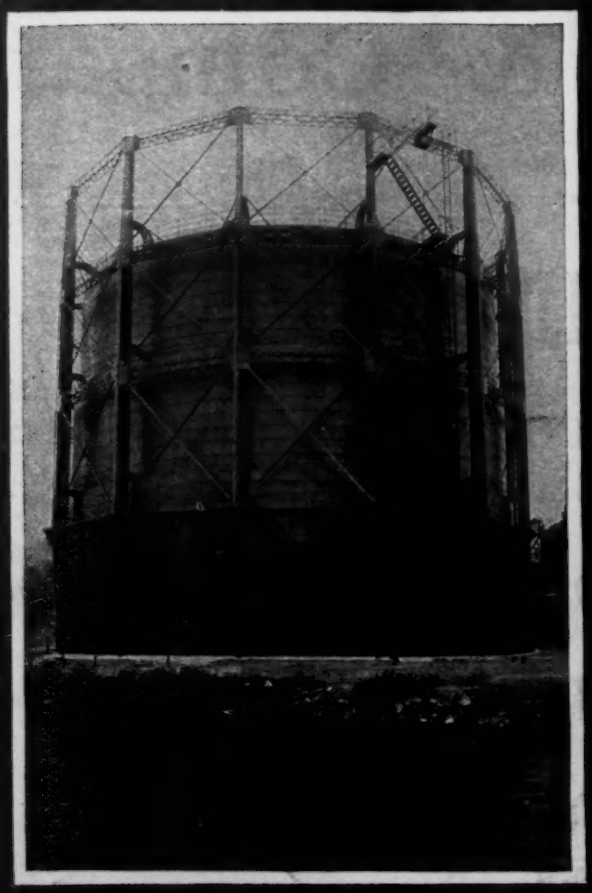

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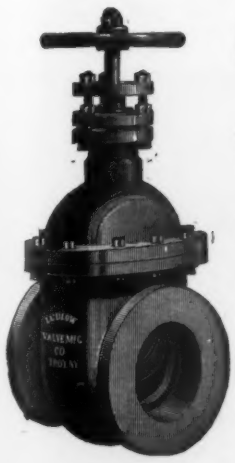

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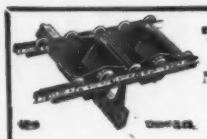

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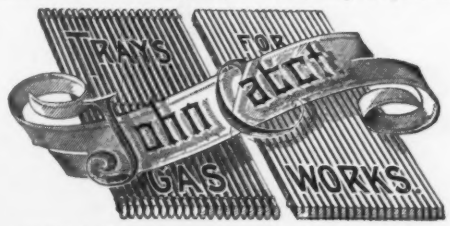

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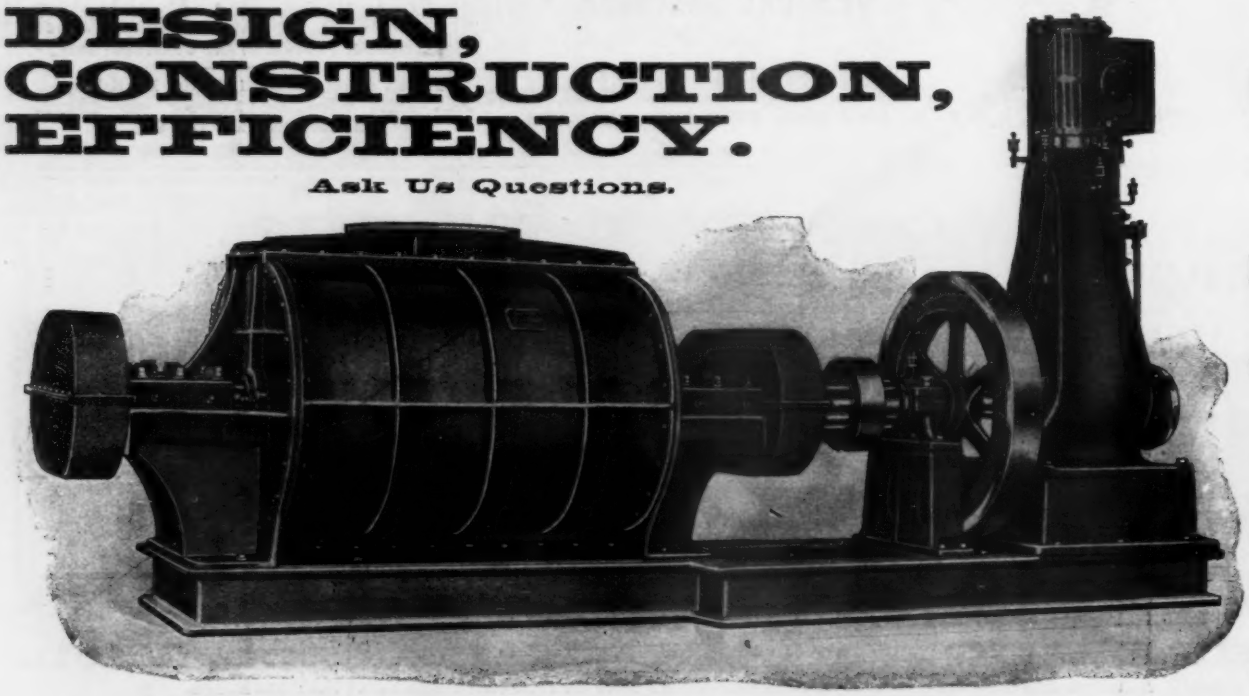

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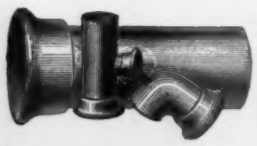

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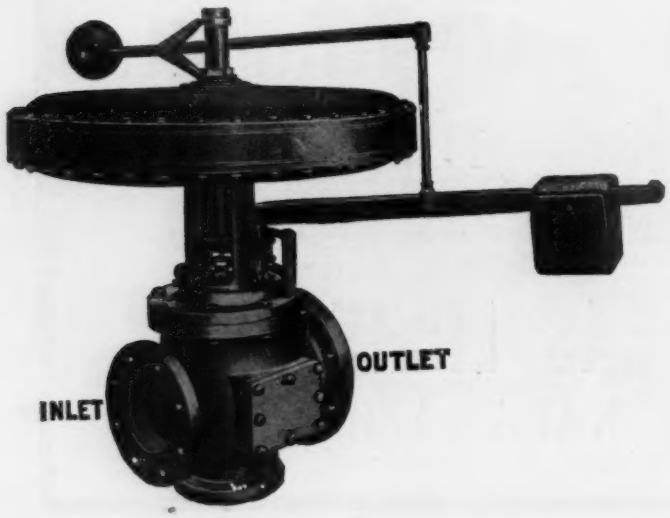

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Our DUPLEX SENSITIVE GOVERNOR, with Automatic Cutoff for district service, will reduce high pressure gas to inches of water without variation.

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PUBLIC LIGHTING TABLE.

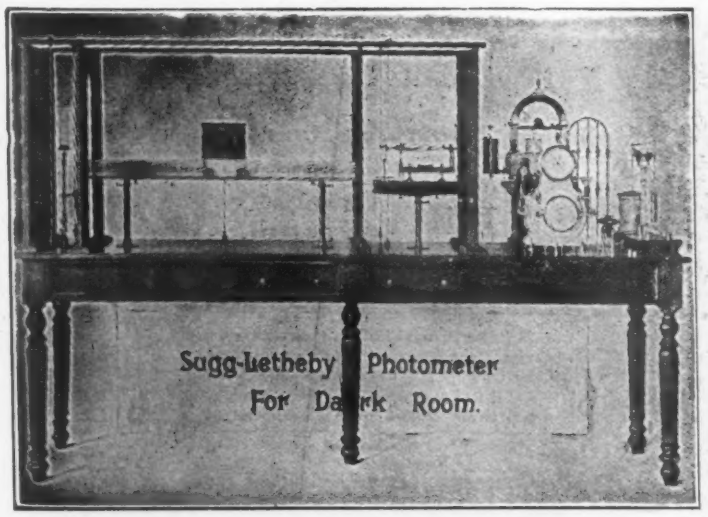
JANUARY, 1907.

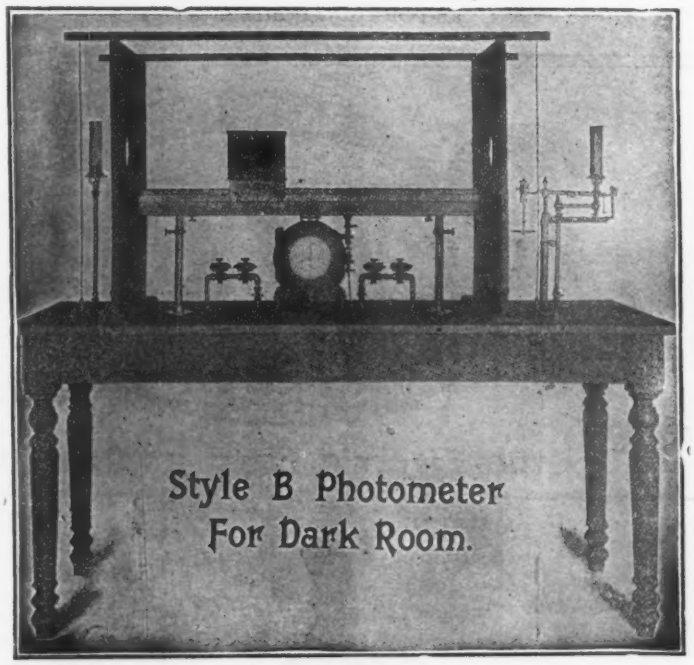
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.
Tue.	1	5.20 PM	7.40 PM
Wed.	2	5.20	8.30
Thu.	3	5.20	9.30
Fri.	4	5.20	10.30
Sat.	5	5.20	11.40
Sun.	6	5.20	12.10 AM
Mon.	7	5.20 LQ	1.50
Tue.	8	5.20	3.00
Wed.	9	5.20	4.10
Thu.	10	5.20	6.20
Fri.	11	5.20	6.20
Sat.	12	5.20	6.20
Sun	13	5.30 NM	6.20
Mon.	14	5.30	6.20
Tue.	15	5.30	6.20
Wed.	16	5.30	6.20
Thu.	17	5.30	6.20
Fri.	18	9.10	6.20
Sat.	19	10.10	6.20
Sun.	20	11.10 FQ	6.20
Mon.	21	12.10 AM	6.20
Tue.	22	1.10	6.20
Wed.	23	2.10	6.20
Thu.	24	3.00	6.20
Fri.	25	4.00	6.20
Sat.	26	4.50	6.20
Sun.	27	5.30	6.10
Mon.	28	No L.	No L.
Tue.	29	No L PM	No L.
Wed.	30	No L.	No L.
Thu.	31	5.50 PM	8.30 PM

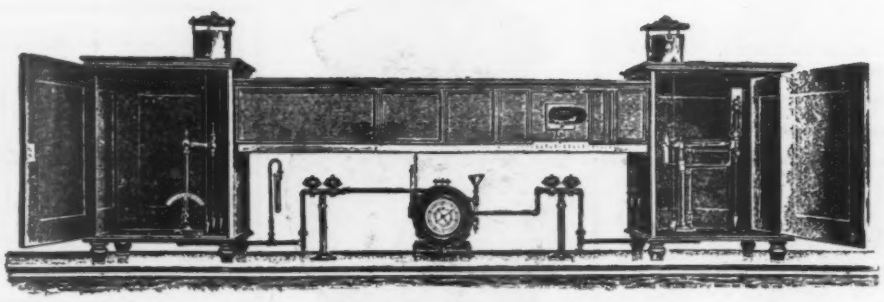
TOTAL HOURS DURING 1907.

By Table No. 1.

	Hrs.Min.
January	211.10
February	193.40
March	182.10
April	167.00
May	157.00
June	145.30
July	151.50
August	162.30
September	175.30
October	202.40
November	209.30
December	231.50
Total, yr.	2190.20







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

JANUARY, 1907.

Day of Week.	Date.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
		P. M.	A.M.
Tue.	1	4.30	6.30
Wed.	2	4.30	6.30
Thu.	3	4.30	6.30
Fri.	4	4.30	6.30
Sat.	5	4.30	6.30
Sun.	6	4.30	6.30
Mon.	7	4.30	6.30
Tue.	8	4.40	6.30
Wed.	9	4.40	6.30
Thu.	10	4.40	6.30
Fri.	11	4.40	6.30
Sat.	12	4.40	6.30
Sun.	13	4.40	6.30
Mon.	14	4.40	6.30
Tue.	15	4.50	6.25
Wed.	16	4.50	6.25
Thu.	17	4.50	6.25
Fri.	18	4.50	6.25
Sat.	19	4.50	6.25
Sun.	20	4.50	6.25
Mon.	21	4.50	6.25
Tue.	22	5.00	6.25
Wed.	23	5.00	6.25
Thu.	24	5.00	6.25
Fri.	25	5.00	6.25
Sat.	26	5.00	6.25
Sun.	27	5.00	6.25
Mon.	28	5.00	6.25
Tue.	29	5.05	6.15
Wed.	30	5.05	6.15
Thu.	31	5.05	6.15

TOTAL HOURS DURING 1907.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
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ST. LOUIS, 712 Roe Building.
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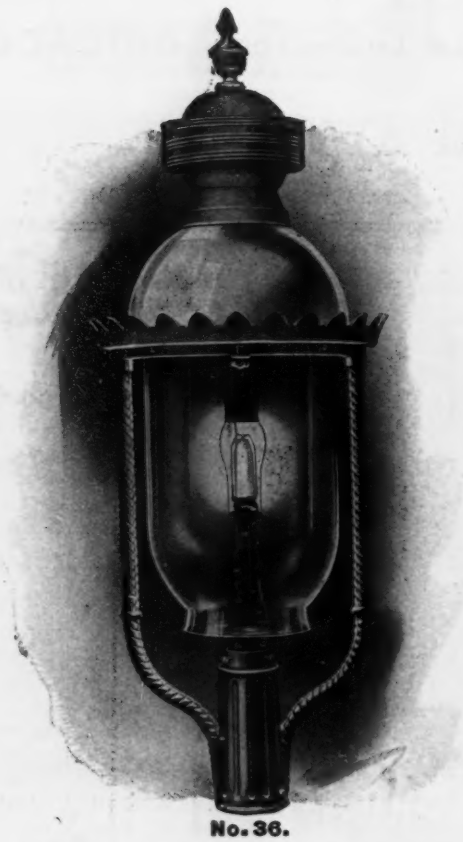
Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.



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Perfect Combustion.
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Will Not Flash Back.
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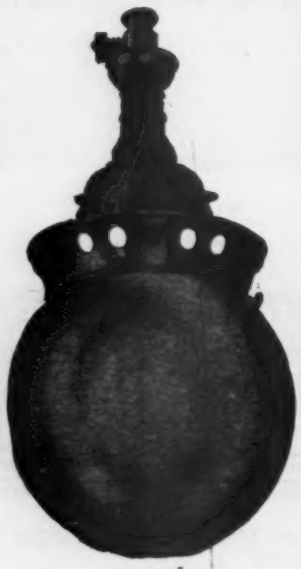

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Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

TOTAL SETS TO JULY 1, 1906, - - - - - 618

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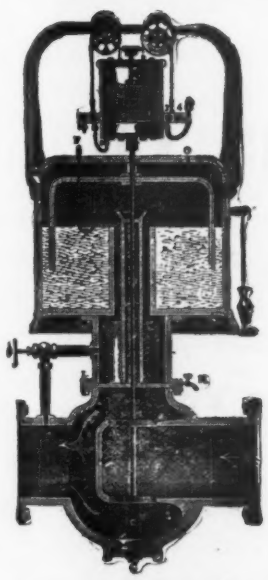

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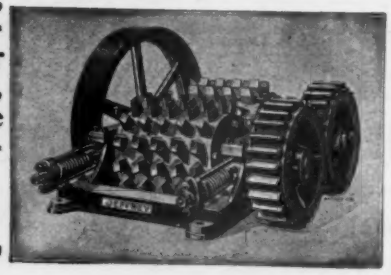

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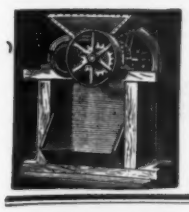

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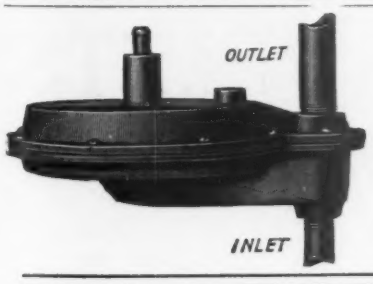

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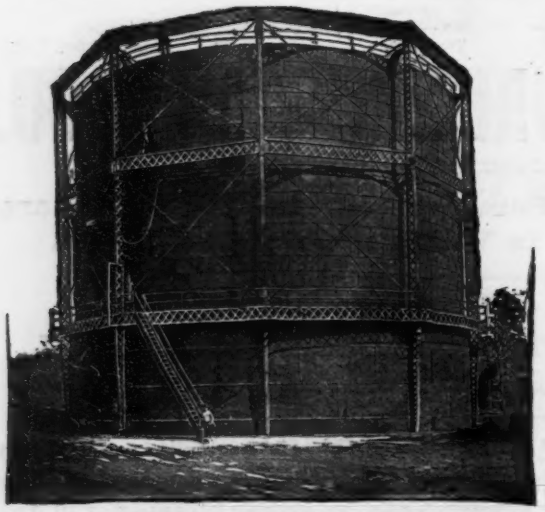

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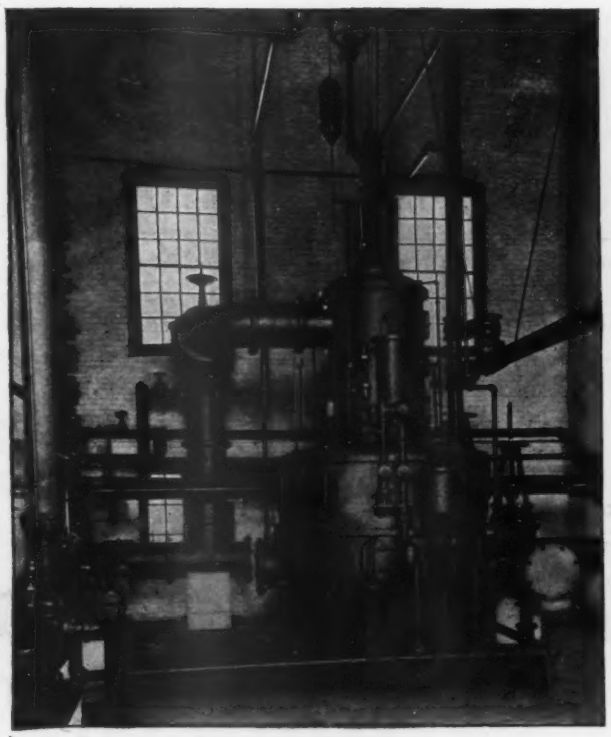

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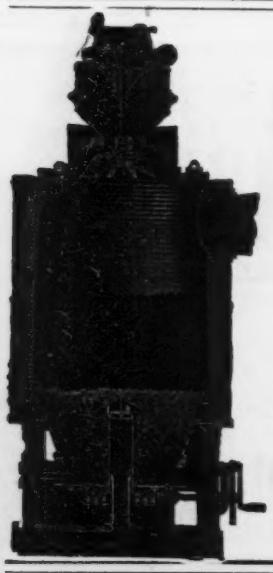

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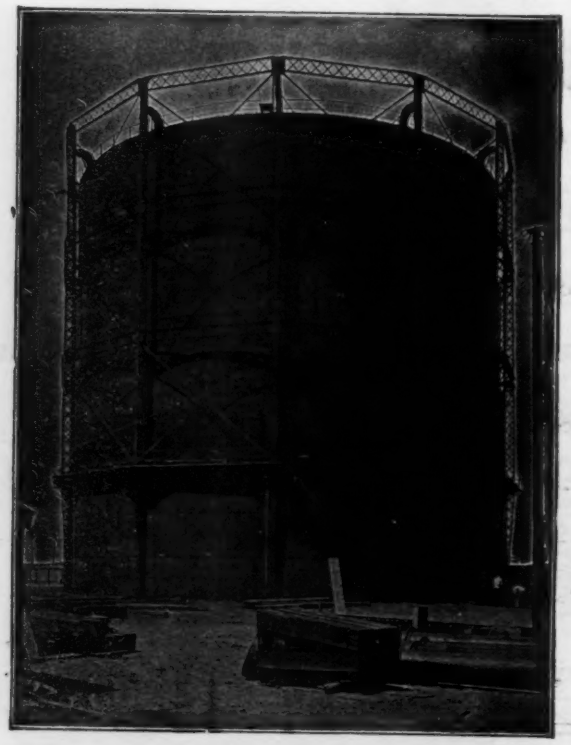

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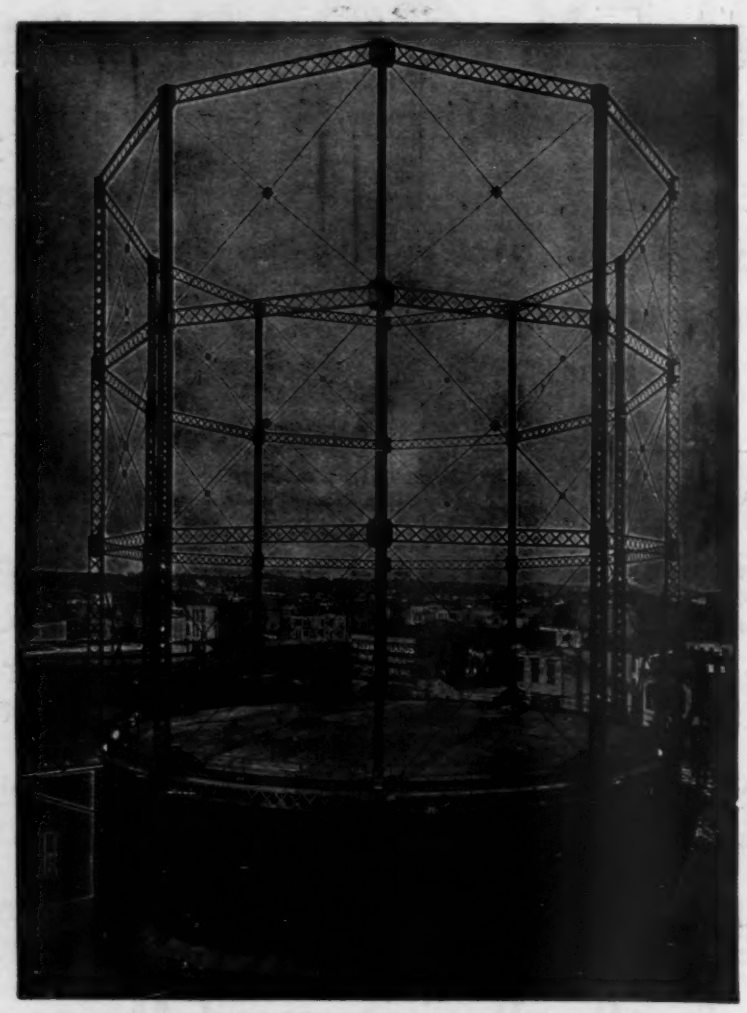

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